THE DEVELOPMENT OF A MARINE ENGINEERING PROGRAM FOR

TRAINING CRUISES OF THE TEXAS MARITIME ACADEMY

A Thesis

by

KLAUS V. LUEHNING

Submitted to the Graduate College of the
Texas A&M University in
partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

January 1966

Industrial Education

[redacted]

THE DEVELOPMENT OF A MARINE ENGINEERING PROGRAM FOR TRAINING CRUISES OF THE TEXAS MARITIME ACADEMY

A Thesis

by

KLAUS V. LUEHNING

Approved as to style and content by:

____
(Chairman of Committee)

____
(Head of Department)

____
(Member)

____
(Member)

____
(Member)

January 1966

PREFACE

The academic program of the Texas Maritime Academy includes three summer cruises conducted aboard a training ship while the vessel is en route to various ports around the world. The purpose of the cruise is to give each Cadet the opportunity to exercise the knowledge he has acquired in the classroom, to expand that knowledge and to acquire the attitudes, abilities and qualities of a ship's officer.

The training program is composed of the execution of various tasks, the completion of which will render the student competent in the required professional abilities of his major area of study. The training program which was developed for the Texas Maritime Academy was devised and organized with the objective of using the training ship to its maximum as a training device.

The training program presented in this study applies only to the marine engineering students of the Academy, although the basic format of the program was also used by the Marine Transportation Department in the formulation of its training program. In addition, the program presented is the first training program of the Texas Maritime Academy, which is making its first training cruise aboard its own first training ship. The first two training cruises made by the Academy since its establishment were made aboard the ships of other maritime schools.

In the development of this study, there have been countless people and agencies who have contributed one way or another in the last two years to make this program and the cruise possible. To name all the

contributors would be impossible, however, some do deserve the recognition that they participated in a project which would not have been possible without their help and guidance.

Special thanks go to Captain Bennett M. Dodson U.S.N. (Ret.), the Superintendent and Dean of the Texas Maritime Academy who allowed the use and manipulation of all the facilities and staff to help execute this program and make the cruise a reality. Those on the staff of the Academy who have been plagued with questions and who have contributed both to the training program and the conduct of the cruise are: Lt. D. C. Mercer, Fourth Assistant Engineer; Lt. D. French, Third Assistant Engineer; Capt. Hugh F. Giblin, Chief Engineer; Cdr. F. W. Smith, Executive Officer; Cdr. F. Tormollan, and Lt. D. P. Cannon. The budgetary and purchasing work that was necessary for the cruise would not have been possible without the help of Sam Cook, Chief Purchasing Agent for the State of Texas; Wesley Donaldson and George Litton of the Purchasing Department of Texas A&M University; James H. Allen, Head Accountant for the Academy; Charles Shook, Assistant Accountant; Nancy Leach, Senior Secretary; and John Harris, a freshman student at Texas A&M who helped compile the Engineering Department stores lists while working with the author on weekends, holidays and nights. The secretarial work was immense, and those who patiently typed the requisitions, the master log book sheets, the grade reports, and the 400 page Officer-Faculty Guide are: Nancy Leach, Dee Bonorden, Pamela Ryan, Dave Mercer, Shirley Button, and Carolyn Sheebergen. Those who were directly concerned with the Training Ship TEXAS CLIPPER and who put up with prodding and requests are: Jack Moore, Ship Superintendent at Todds Shipyard in Galveston; Bill Unterhoeven of Flood and Calvert, marine suppliers; L. R. Enstice, who did an admirable job putting the main engine lube oil system into operation; and Fred Kreidt, Junior Engineer, without whose help in all phases of the operation of the Engineering Department much would have been lost and impossible. Special thanks go to Prep-Cadet R. K. Johnson, who served as valet-butler-steward-secretary for the duration of the cruise, and collected, sorted and filed grade reports, grades, written assignments, blueprints, instruction books, and continually served to brighten the spirits of the author when things appeared the worst.

Last but not least, thanks to my wife Barbara, who patiently has read, proofread, participated in and seen the results of all that I have tried to accomplish in this study.

TABLE OF CONTENTS

		Page
PREFACE		iii
LIST OF TABLES		vii
Chapter		
I.	INTRODUCTION	1
	Background	2
	Statement of the Problem	5
	Significance of the Problem	6
	Hypothesis	8
	Assumptions	8
	Procedure	9
II.	REVIEW OF LITERATURE	11
III.	DEVELOPMENT OF THE TRAINING PROGRAM	16
	Criteria for the Training Program	25
	The Proposal	29
	The Officer-Faculty Guide	34
IV.	PREPARATIONS FOR THE CRUISE	38
V.	THE CRUISE	45
	At Galveston	45
	Underway	48
	Evaluation	51
VI.	CONCLUSIONS AND RECOMMENDATIONS	57
	Conclusions	57
	Recommendations	60
BIBLIOGRAPHY		63
APPENDIX A.	1964 CRUISE TRAINING PROGRAMS	73
APPENDIX B.	1965 CRUISE OFFICER-FACULTY GUIDE	94
APPENDIX C.	PREPARATIONS ITINERARY	254

LIST OF TABLES

Table		Page
1.	SEA PROJECT ASSIGNMENTS COMPLETED	53
2.	DISTRIBUTION OF THE ACTUAL ASSIGNMENT NUMBERS COMPLETED FOR ALL SEA PROJECTS AND ALL CADETS	55
3.	DISTRIBUTION OF FINAL GRADES	56

CHAPTER I

INTRODUCTION

Under the terms of the Merchant Marine Act of 1936, the American merchant fleets of vessels are now undergoing a vast replacement program. Under the terms of the Act, ships are built to have a useful life of approximately twenty to twenty-five years, at which time the ships are to be scrapped or laid up and replaced by new construction. The measure was designed to keep the vessels up to date in technological sophistication, to keep the shipyards open and economically employed, and to save and develop the specialized skills needed in shipbuilding. At the time of the passage of the Act, the new advances in marine engineering technology were put into effect; yet the ships were still constructed with the primary criteria of safety, reliability and endurance. These criteria are still paramount considerations in ship design and construction; however, the tremendous growth and development of science and technology has permitted the conception of designs which, in the field, smack of the exotic. New construction today is considered in light of such advances as are made in gas turbines, automation, electronics, nuclear energy, instrumentation, metallurgy, navigation, materials handling, and control techniques.

The operation of the ships of the past was a relatively simple matter in comparison to today's engineering plants. "If you had four quarts of engine oil each watch on the up-and-down jobs and plenty of rags you were okay,"[1] because the older vessels required personnel with some training who with a suitable apprenticeship could master the techniques and processes involved. Today, the operation of ships, which includes overhaul, maintenance, repair as well as start up and securing operations, has become very technical in nature.

Background

With the advent of the steamship in the last century and the rise of a complex industrial society, formal training for officers aboard merchant ships was begun at the New York Nautical School in 1874.[2] The school opened to meet the demands for more and better trained mates and engineers. The New York school is the oldest of its kind in this country and began operations under the auspices of the New York City Board of Education. Governor Tilden of New York State requested a training ship, and the U. S. Navy assigned the sloop of war ST. MARY'S with a cadre of officers as instructors, to the school. The first training cruise was conducted in the waters of Long Island Sound in 1874, and the second to Europe in 1875. The training cruise attempted to train future officers by allowing them actual first hand experience in the rudiments and complexities of seamanship. This practice of

---

[1]Lauren S. McCready, Marine Engineering Instruction in the Modern Age, paper presented before the New York Metropolitan Section of the Society of Naval Architects and Marine Engineers at the U. S. Merchant Marine Academy, 16 April 1964.

[2]State University of New York, Catalog 1964-1965, (Bronx, New York: 1964) pp. 14-15.

conducting training cruises has been continued by every nautical officers school in this country to the present, whenever possible.

The Massachusetts Maritime Academy was opened in 1891,[3] maintaining a training ship at Buzzard's Bay. Pennsylvania opened its training school in 1899, but because of legislative problems in the State Legislature, closed its doors in 1947.[4] The California Maritime Academy was established in 1929 as the California Nautical School and maintains headquarters at Vallejo with the Training Ship GOLDEN BEAR.[5] Under the terms of the Merchant Marine Act of 1936, training of merchant marine personnel became a national issue, with the declaration set forth in Section 101, that ". . . The United States shall have a merchant marine . . . manned with a trained and efficient citizen personnel."[6] As a direct result, the U. S. Merchant Marine Academy was begun in New London, Connecticut in 1938. With the advent of the Second World War and the Desperate need for ships and men, Maine Maritime Academy was begun at the Pentegoet Hotel in Castine at the mouth of Penobscot Bay in 1941. With the exception of Pennsylvania, all of the foregoing schools are still in operation; and with the

---

[3]U.S., Maritime Administration, Review of Merchant Marine Personnel Training Program, (Washington D.C.: U. S. Department of Commerce, April 1955), p. 10.

[4]Ibid., p. 12.

[5]California Maritime Academy, Catalogue 1965-1966, (Vallejo: California Maritime Academy, 1965), p. 9.

[6]Review of Merchant Marine Personnel Training Program, p. 1.

exception of the U. S. Merchant Marine Academy, all maintain training ships.

The latest school to open for the training of ship's officers is the Texas Maritime Academy, which accepted its first class in 1962. However, the idea of a nautical school on the Gulf Coast dates back to 1931, when the Texas State Legislature enacted a law which authorized the establishment of the school under jurisdiction of the Texas A&M College Board of Directors, but provided no funds to start the school. The idea lay dormant until 1958 when Admiral Walter L. Ford U.S.N. (Ret.), Deputy Maritime Administrator of the U. S. Maritime Commission addressed the Galveston Chamber of Commerce and conveyed the desirability of a nautical school in the Gulf Coast.[7] The Chamber appointed a Proposed Merchant Marine Academy Committee and after four years of legislative and administrative work, the Academy was officially established on February 24, 1962, as part of the Texas A&M University System.[8] Since 1962 and its first class of twenty-two students, the Academy has expanded to a faculty of twelve, a campus in Galveston and has its own training ship.

The traditional method of training candidates as ship's officers was what can be classed on-the-job training. Those officers who did

---

[7]Galveston Chamber of Commerce, A Presentation of The Need for a Maritime Academy in Texas, Submitted by Capt. S. B. Wetmore, Chairman of the Proposed Merchant Marine Academy Committee for review by the Texas Commission of Higher Education, 1959.

[8]Texas Maritime Academy, Self-Study, mimeographed.

not graduate from a nautical school usually came up from the ranks of crew members, a process called "coming up the hawsepipe" or "up from the fo'c'sle." The nautical schools prepared officers on a more formal academic basis where their training was supervised aboard a training vessel. The early programs were usually two year programs where a student undertook the marine engineering or the marine transportation curriculum. The former deals with the operation, maintenance and repair of all the mechanical and electrical machinery aboard, and the latter with navigation, seamanship and cargo handling. Upon graduation the candidates were tested as to proficiency in their respective fields and were granted Licenses as Third Mate or Third Assistant Engineer by the U. S. Coast Guard representing the U. S. Government. As the officers gained experience they could take advanced tests until they reached the rank of Master or Chief Engineer. The only professional requirements today for one up from the fo'c'sle to become a mate or engineer is still qualified experience in un-licensed ranks and passing the license examination.

Statement of the Problem

The problem of this study was to design and execute a training program for the marine engineering students of Texas Maritime Academy for use aboard its own training ship, the TEXAS CLIPPER. The program was the first training program of the Academy and was used on the first training cruise during the Summer of 1965.

In designing the training program for the Academy, many factors had to be taken into consideration. Some of the factors involved in the first cruise were the following:

1. A suitable training ship must be selected.
2. The training ship must be conditioned and provisioned.
3. Budgets must be prepared to guide all departments.
4. An organization of personnel must be made to satisfy the normal operation of the ship, emergency conditions and the conduct of a training program.
5. A training program must be devised.
6. Suitable control measures must be established to gauge the functioning of the department as a whole, as well as the performance of the student in his various activities.
7. A time schedule must be developed to guide all personnel to the accomplishment of those tasks which are deemed necessary to prepare for and conduct the cruise with success.

Significance of the Problem

The primary significance of the problem lies with the basic concept that for any program to succeed in its objectives proper preparations should be made in advance. Because of the peculiar problems associated with the development of the Academy, the program eventually put into effect should emphasize in the minds of the students, the faculty and responsible administration that training cruises are an essential part of the education of the marine engineering officers and that the first cruise need not be an exception to carrying out the best training possible.

The training program takes on additional significance because the Academy is an accredited college. As such, its curriculum must conform to the accrediting committee's minimums in the way of required work. This requirement has caused the engineering curriculum of Texas as well as other nautical schools to increase the requirements in science, mathematics, theoretical engineering subjects and the humanities. The U. S. Coast Guard still demands of the candidate a good background in the "practical arts" of ship operation. Because the "practical" courses of study are slowly being reduced in the shoreside class schedules, the training cruise then becomes a focal point in the mastering of the knowledge and skills necessary to function as an engineering officer.

In attempting to formulate a framework in which to develop a suitable program, the training carried out on other training ships was investigated. It was found that one school had no formal written program at all. Another school published rotation schedules and conducted some lectures. A third school has some lectures and a few written assignments in an unrealistic merchant marine setting. Of the material published and available, none conformed to the needs of the Academy.

Hypothesis

The hypothesis upon which this study is based is that when a training program for the engineering students in nautical schools is properly planned, organized and administered for the purpose of training these students, a training program can be designed to afford the student the best possible learning experiences aboard a ship. After a series of trials and further development of the program, it will serve as a model program for other nautical officers schools

Assumptions

Certain assumptions were deemed necessary to complete this study, and they will be used to construct the training program and are listed below.

1. The Superintendent of the Texas Maritime Academy will assign the author of the study to a position on the Academy staff indicative of the responsibility for preparing an organization and training program for the Engineering Department aboard the Training Ship TEXAS CLIPPER.
2. Whereas the first two cruises of the Academy were conducted aboard the training ships of other maritime academies, the third cruise will be aboard its own training ship, using its own faculty and staff.
3. The student body of the Academy enrolled in the marine engineering curriculum will be of a sufficient number to conduct the cruise in the Summer of 1965 as will be planned for in

the general organizational framework of the Engineering Department.

4. A proposal as presented to the Superintendent for approval, will be accepted as the general framework through which the formal and final program will be developed.

5. The training program will be allowed to go to completion during the first cruise with exceptions made in cases where the preceding assumptions do not hold true, and in cases where unpredictable conditions might exist, such as unfavorable weather, major breakdown of machinery, unfavorable port schedules, international or national strife, and acts of God.

Procedure

The procedure for completing this study will be by completing the steps listed below.

1. Prepare a proposal to the Superintendent of the Texas Maritime Academy for review and approval, outlining the general framework of the organization and functioning of the marine engineering training program.
2. Prepare the overall organizational scheme of the Engineering Department aboard the training ship.
3. Prepare the various elements of the training program.
4. Prepare a time schedule for the completion of all necessary tasks before embarkation and departure.

5. Select a training ship from available sources for the Texas Maritime Academy.
6. Prepare a budget for the ship and the Engineering Department, and prepare the requisition of supplies and materials.
7. Print the entire Engineering Department training program in two ways:
   a. an Officer-Faculty Guide for the information and guidance of faculty and staff containing all the information available; and
   b. a Cruise Book or training manual for the Cadets, containing the organization and assignments for the cruise.
8. Before departure from Galveston, assign appropriate duties and responsibilities to faculty, staff and students.
9. Conduct the cruise and implement the training program.
10. Upon completion of the cruise, conduct interviews with faculty, staff and students to ascertain the effectiveness of the program.
11. Write the final form of the study, including the nature of the program, the functioning of it, the effectiveness of it, including comments and recommendations from personal observations and experiences.

CHAPTER II

REVIEW OF LITERATURE

Within the last fifteen years there has been a considerable amount of literature concerned with the advances and changes occurring in the maritime industry. The "Atomic Age" fostered growth on many fronts, and with the launching of the world's first nuclear powered ship, the N/S SAVANNAH, a new era of shipping began. There has been much research done in the last few years under the auspices of the U. S. Maritime Administration; and ships like the DENIZEN, a hydrofoil craft, and the air cushion vessels are manifestations of this effort. However, there has been relatively little information produced in the area of education in the industry; and there is no source available which describes the methods, goals, objectives, organization and procedures used to train either engineers or mates for the shipping community.

In a paper, the first of its kind, McCready[9] describes some of the changes that have occurred in the industry and some of the changes he foresees in the future. He outlines some of the steps now being taken at the U. S. Merchant Marine Academy (where he is Head of the Marine Engineering Department) to upgrade their curriculum in order to better prepare their students for the innovations of technological progress. Recently, a trial program was begun where a select number

---

[9] Lauren S. McCready, op. cit., pp. 5-36.

of students will be trained to be capable of sitting for both the engineers or the mates license,[10] in anticipation of the day when completely automatic engine rooms will not require a watch standing engineer. Some other problems are also assessed which face maritime schools in attempting to maintain a balanced curriculum by satisfying accreditation committees, the state of the art and its progress, and the shipping community which still operates some old ships.

Other literature available is related to the problem but offers little help in providing solutions, methods, or procedures for this unique course of study. In a report by the Maritime Evaluation Committee,[11] in Recommendation 4 - Technical Training, strong emphasis is made that increased training and facilities be provided for maritime students and that more students be urged to undertake the engineering course of study. The National Academy of Sciences[12] discusses the importance of ships and an adequate supply of trained merchant marine personnel in a report describing the role of the U. S. Merchant Marine in national defense.

---

[10]Bob Ware, "Editorial Log," Marine Engineering/Log, Vol. LXX, No. 9, Aug., 1965.

[11]U.S., Department of Commerce, Maritime Resources for Trade and Security, the report of the Maritime Evaluation Committee to the Secretary of Commerce, Luther H. Hodges, January 1963, p. 17.

[12]National Research Advisory Committee. "Role of the U. S. Merchant Marine in National Security." Project Walrus Report by the Panel on Wartime Use of the U. S. Merchant Marine, Volume 2. Proposed Program for Maritime Administration Research. Washington D. C.: National Academy of Sciences-National Research Council, 1960.

Mattson[13] explains the interdisciplinary nature of today's technology and cites revisions made in some schools in their curriculums to attempt the formation of a new breed of men, the "compleat [sic] technologist," who will be needed soon and in quantity. A reflection of this need is the trial program at the U. S. Merchant Marine Academy cited earlier, where a student will be adaptable to all aspects of ship operation. In an effort to prepare for this new age, one engineer's union has opened a series of schools to upgrade its membership, the first such school being in New Orleans.[14] William B. Johnson[15] sees a crisis in transportation education as a whole and says:

> I place the blame squarely on our industry for general lack of interest in transportation as a career on the part of high school and college students . . . . We must meet the intellectual challenge to the transportation industry through imaginative, stimulating, educational programs of all kinds.

Captain E. B. Perry U.S.N. (Ret.)[16] writes that:

> Automated ships will require men with greater talents. The crew costs, per man, will go up with greater skills required and we may find that we have more technicians and fewer seamen . . . . We must accept the advantages of labor saving devices and let them become our slaves, not our masters. They must be backed up by the brains which made them possible. If properly selected, accepted and utilized automation can reduce costs and become a better way of life for the more men who will go to sea.

---

[13] Howard W. Mattson, "In Our Opinion," editorial, International Science and Technology, No. 30, June 1964.

[14] American Marine Engineer, May 1964, p. 7.

[15] William B. Johnson, "Crisis in Transportation Education," National Defense Transportation Journal, Nov.-Dec. 1962.

[16] E. B. Perry, "Shipboard Automation: How Much is Enough," Navy, Magazine of Sea Power, June 1964.

Additional literature is available describing the advances that have occurred, are occurring and that are planned in the future for the maritime industry. In an effort to keep up, the maritime schools have lengthened their curriculums and are upgrading them. However, a basic consideration in ship design is to maintain the level of difficulty in operation as low as possible so that the available supply of operating personnel is not outdated. Carl Fixman, Chief of the Division of Power Research, U. S. Maritime Administration agrees that additional skills will be necessary,[17] and C. Tangerini, Assistant Chief of the Division of Ship Design says:

> From a technical viewpoint, this Division feels the process of indoctrination of engine department crews for the automated ships would not require specialized courses of training, but we could agree that the more skilled crew would be desirable particularly for the earlier ships in the program.[18]

To summarize, the American Merchant Marine is now undergoing a vast replacement program, and the ships being built are far advanced and technologically superior to the fleets built during and immediately after World War II. The government, industry, labor and professional organizations are aware of the present and potential training needs of those who are to join and are practicing in the merchant marine officer ranks. Little literature is available which points out the methodology or criteria to use in the development of curricula or training programs for the maritime schools now in operation. With the literature

---

[17] Mr. Carl Fixman, personal correspondence.

[18] Mr. C. Tangerini, personal correspondence.

available and with experience gained with the training programs of two other schools, the development of a program for Texas had to be born out of fundamental considerations which will hopefully provide a base for the future development and improvement of the quality of instruction and the student.

CHAPTER III

DEVELOPMENT OF THE TRAINING PROGRAM

With the first cruise of the ST. MARY'S in 1874, an old tradition of training for the life at sea continued in this country. The training cruises of the past and the cruises today have not changed in the objective sought by this method: to bring to the student, first hand, actual experience in the complexities of ship operation, the manner and ways of the life at sea, and a chance to experience the beauty and work that makes a cold iron-hull a living instrument in the economic well-being of the country, the company that owns it, and the individual who sails it.

The operation of a ship, from the engineering point of view, is a matter of understanding the systems and equipment as they are installed aboard a ship; an understanding of the processes, methods and procedures necessary to start, secure and adjust various systems and equipment to load demands; and to have sufficient skills to maintain, repair, overhaul and cope with emergency situations with all systems, equipment and personnel aboard.

The fundamental as well as the advanced theory to understand the nature and the functioning of most of this equipment can be taught in the classroom with demonstrable success. Most mechanical engineering courses of study are parallel with marine engineering curriculums; however the stress in application is different. Courses in mathematics, physics, thermodynamics, strength of materials, and fluid mechanics are as akin to marine engineering as they are to mechanical; and in some instances the same college texts are used. In practically all cases, theory courses in marine as well as mechanical engineering are taught in a classroom situation, with all of the usual accoutrements and the pros and cons for the lecture type of teaching method.

Included in most marine engineering curriculums are laboratory courses, as there are in mechanical engineering. The laboratory course proposes to allow the student actual manipulation of selected pieces of equipment and/or systems, to develop in the student coordination of hand, eye and mind to the successful or unsuccessful conclusions dictated by theory learned in the classroom. The student develops perspective, to a degree, by being able to deal in more tangible elements and has the opportunity to test and question the operations theoretically possible. In the laboratory situation both programs attempt to transfer available knowledge, as well as develop adequate skills in the manipulation of various equipment.

In the marine engineering programs of all the academies in operation today, the training cruises form an essential element in the student's education. A comparable parallel in the mechanical engineering or other engineering programs would be required summer or cooperative work plans to supplement classroom work with actual experience. The training cruise attempts to develop in the student the requisite understanding and skills necessary to operate and maintain any type of vessel of unlimited scope. The necessity for this broad scope is that for a student to graduate and sail as a merchant marine officer he must be in possession of a U. S. Coast Guard License. The authority for this is given in Rules and Regulations for Licensing and Certificating of Merchant Marine Personnel, Subchapter B, CG 191, U. S. Coast Guard, Treasury Department, July 1, 1963, which states in part:

> 10.02-1 Issuance of Licenses
> 10-02-1 (a) Applicants for licenses are charged with the duty of establishing to the satisfaction of the Coast Guard that they possess all of the qualifications necessary, such as age, experience, character and citizenship, before they shall be entitled to be issued licenses. Until an applicant meets this mandatory requirement, he is not entitled to be licensed to serve as an officer on a vessel of the United States.

In the Spring of 1963 the Texas Maritime Academy had twenty-two students who had completed their freshman year on the College Station campus of Texas A&M University. Because of the lack of students, personnel and a training ship, arrangements were made to have the Texas students participate in the Summer Cruise Program of the New York Maritime College Training Ship EMPIRE STATE IV. The author was engaged by the Texas Maritime Academy to sail as Second Assistant Engineer aboard the training ship and to act as Commandant of the Texas Cadets. The engineering and transportation students were integrated into the student organization and the training programs. By mutual consent the author participated in the training program of New York and also became an Engineering Training Officer.

The training program of New York consisted of watch and classroom experience, with a rotation into a maintenance section every fourth day. The training program, as such, was not published, and consisted of eleven lectures given to each class, watch standing experience and an oral examination given by a Watch Engineer at the end of the cruise. In addition, the student attended medical lectures to certify for the First Aid Certificate necessary to apply for the license examination upon graduation. Also, each student had a reading program to complete which consisted of writing five or six book reports. The cruise lasted 87 days with the ports of Dublin, Bremen, Antwerp, Naples and Palma de Majorca.

The schedules which were developed for the rotation of the students through their various assignments were written for that year only, indicating actual days, dates and times. The lectures in engineering subjects were not outlined and no specific demands were made as to scope or content of the lecture. The student was graded for his watch standing, one grade report being filled out for each watch, utilizing a numerical grading system. There were no written assignments required in the engineering subjects, but tests were given in subject matter covered in lectures. The students were rotated every two days with the hope that the student would acclimate and adjust to the job assignment in that period. The senior class was called upon as a class to write and publish a Qualifying Book, which consisted of operational procedures for most of the major pieces of equipment aboard the New York training ship. A number of seniors were chosen to function as "Kings" and were solely responsible and responsible only for certain systems aboard the ship, and did not participate in the rotation and watch standing schedules.

Following the cruise in 1965, the fall semester for this first class was spent on the Galveston campus of the Texas Maritime Academy. The new class began their studies at College Station. The split campus was necessary because of the lack of facilities and staff in Galveston to teach most of the freshman courses required by the curriculum. New York could not accommodate the Texas group the following year for the cruise of 1964 because of lack of living accommodations. All the maritime academies were contacted, and Maine Maritime Academy agreed to have them on their cruise in the Spring of 1964. Maine conducts two cruises in the spring rather than summer to accommodate their special arrangements relative to available ports to visit, curriculum, academic year and enrollment.

On February 1, 1964, the Texas Cadets, now comprising a freshmen and sophomore class, embarked for the second cruise aboard the T/S STATE OF MAINE in Galveston. The author again sailed as Second Assistant Engineer, Commandant of Cadets and Engineering Training Officer. Early attempts were made to secure the training program from Maine to be used as a guide for orientation and indoctrination; however, these attempts failed and it was found that there was little to be had in any case. Maine conducted no lectures, required no grading for watch or day work assignments, conducted few tests, and had students complete a short series of short answer questions and some engineering drawings. In view of the situation, and with permission from the Commanding

Officer of the T/S STATE OF MAINE, the author exercised his responsibility and initiated a Texas Maritime Academy Training Program in the latter part of the first week at sea. That program, admittedly hastily put together, is in Appendix A. The nature of the program was an outgrowth of the experience the author had with New York and from his alma mater, The U. S. Merchant Marine Academy. The Texas Engineering Cadets received written assignments to complete and were given lectures by the author as described in the report to the Superintendent (Appendix A). The cruise with Maine lasted from Feb. 1 to April 11, 1964, with calls at Aruba; Curacao; San Juan, P. R.; Castine, Maine; and Cartagena, Columbia.

The California Maritime Academy conducts a training program structured basically like that of New York.[19] A manual is prepared and distributed to the students and contains job descriptions, basic organization, written assignments and considerable operational procedure for sailing the T/S GOLDEN BEAR. The engineering cadets receive an average of eleven lectures and are given a few written assignments.

The U. S. Merchant Marine Academy conducts the only outstandingly different type of practical sea training. The Merchant Marine Act of 1936 provided that ships built under the Act will have accommodations built into them to house one or more Engine and Deck Cadets. The first year at the federal Academy is spent on campus at King's Point, Long

[19]California Maritime Academy, "Department of Marine Engineering Instruction Book," Sea Training Trimester, 1959.

Island, New York. The second year is spent at sea aboard a commercially operating merchant vessel, with status aboard the vessel as a Junior Engineering Officer. The cadet joins the department and under the supervision of the Chief and/or the First Assistant Engineer performs work and assignments usually performed by the engineering department. The cadet works a full eight hour day or stands two four-hour watches per day. In addition, each cadet must complete a Sea Project which is a voluminous correspondence-type collection of written assignments covering most of the subject matter pertaining to the operation of marine power plants. He also has English assignments to complete, a machine shop project, and mathematics assignments. This academic work is performed in the cadet's spare time. The cadet usually sails aboard three different types of vessels to different areas of the world when scheduling and opportunity permits. The last two years are then spent on campus at King's Point.

All the foregoing types of training programs and the experiences shared attempt to bring to the engineering cadet first hand knowledge of marine power plant operation. The skills are necessary in that with the issuance of a U. S. Coast Guard License and employment aboard a ship as a watch standing Third Assistant Engineer, the individual is responsible at that point, without further benefit of instruction or training, for the operation of the entire engineering plant and for the safety of the ship and its crew. The various areas of training that are required are given in CG 191[20] and the various classifications of subject areas are given below.

SUBJECTS

A. GENERAL

1. Pumps and compressors
2. Heat exchangers
3. Propellors and shafting
4. Steering and miscellaneous machinery
5. Valves - reducing, control, etc.
6. Condensers, air ejectors and vacuum
7. Engineering definitions and principles
8. Instruments
9. Lubrication
10. Inspection
11. Mathematics
12. Sketch
13. Ship construction and repair

B. STEAM ENGINES

14. Reciprocating - construction, operation, maintenance
15. Turbine - construction, operation, maintenance
16. Reducation gear and miscellaneous
17. Steam governors

C. MOTOR (DIESEL)

18. Construction, operation, maintenance
19. Operating principles
20. Fuel Injection
21. Air Compressors
22. Operation and maintenance of auxiliary diesel engines
23. Air-starting, combustion
24. Governors

---

[20]U.S., Treasury Department, U. S. Coast Guard Rules and Regulations for Licensing and Certificating of Merchant Marine Personnel, Sub-chapter B, CG 191: July 1, 1963.

D. BOILERS

25. Watertube, construction, operation, maintenance
26. Firetube - construction, operation, maintenance
27. General - construction, operation, maintenance
28. Safety valves
29. Corrosion and feedwater
30. Fuels and combustion

E. ELECTRICITY

31. Direct current
32. Alternating current
33. General - switchboard, controls, wiring
34. Storage batteries
35. Electric drive
36. Problems

F. REFRIGERATION

37. Freon - construction, operation, maintenance
38. Definitions and principles

G. ENGINEERING SAFETY

39. Fire prevention
40. Fire equipment
41. Fire fighting
42. Respiratory apparatus and emergency equipment
43. Casualty and damage control
44. Rules and regulations
45. Safe handling of inflammable and combustible materials.

Where the foregoing subject matter cannot or was not covered in the training programs described, courses are usually set up ashore dealing with the subject specifically. A current trend is to upgrade the curriculums of these schools in order to satisfy accreditation committees. This has resulted in the decrease of the "practical" or "laboratory" courses offered by these schools in order to accommodate required hours in mathematics, science, engineering theory courses and the humanities. Because the U. S. Coast Guard License requirements have not changed in view of this, it behooves the Engineering Departments and the Training Officers to use the available time and facilities to the best possible advantage while making a training cruise.

Criteria for the Training Program

The construction of the training program for Texas had to encompass considerable originality in that the programs of the other schools were too varied and/or did not meet the needs of the Academy or the purpose of this study. Some of the variations which are in existence are as follows:

1. The U. S. Merchant Marine Academy uses the entire sophomore year to train its cadets at sea, some on a full year basis, and others on a "split-year" basis of two six-month intervals over a two year period to preserve certain athletic teams during various sports seasons.
2. The New York State Maritime College uses the summer for its training cruises aboard the EMPIRE STATE, but has two curricula within marine engineering, so that some students are marine engineering majors and others are nuclear science majors.
3. Maine Maritime Academy conducts two cruises during the

spring, using one half of the student body for one and the other half for the second cruise. While one half is on cruise the other half is in session in classrooms at Castine.

4. California Maritime Academy uses the cruise period as a semester in a trisemester academic year which is conducted from Jan. 3 to March 25, for example, as scheduled for 1966. The entire collegiate program is three years long, and an accredited degree is not granted.
5. Massachusetts Maritime Academy also conducts a three year program but cruises during the summer.
6. Texas Maritime Academy has a four year accredited program with cruises scheduled during the summers.

With all of the variations, however, all of the programs satisfy the U. S. Coast Guard requirements in experience, age and suitability of the candidates to sit for the License of Third Assistant Engineer Steam Vessels Unlimited Horsepower, and Third Assistant Engineer Motor Vessels Unlimited Horsepower. With the first cruise on the EMPIRE STATE, the first class of TMA was persuing a training program administered by a school which is accredited. On the cruise with the STATE OF MAINE, it was very obvious to the author that an adequate program was lacking. Therefore, the program in Appendix A was hastily drawn up and implemented as part of the TMA four year program for the classes participating at that time.

The criteria that were used to construct the Texas Maritime Academy Marine Engineering Training Program in many cases were an outgrowth of the experience of the author; the limited time left for its completion; the lack of a training ship at the time of inception; and the lack of personnel, staff, faculty, and funds. On the other hand, they were formulated to withstand the test of time to facilitate the conduct of successive cruises, and to provide a foundation from which the improvement of instruction could proceed.

The criteria are as follows:

1. The training program will be written in such a way so as to be applicable for any cruise period, without regard to time of year or any particular year.
2. The training program will be written to be applicable to any training ship, making no exceptions for the first ship, a substitution of training ships, or no training ship at all due to national or international strife or other emergency conditions.
3. The organization of the training program must satisfy the operational needs of the vessel as well as provide the means to conduct the training program.
4. In the development of the organization and in the assignment of duties and responsibilities, adequate provision and flexibility must be provided for:

   a. time for eating

b. time for sleep
c. recreational activities
d. study time
e. lecture hours
f. working hours
g. liberty in port
h. sickness and incapacity to continue in the ship's routine
i. participation in drills and emergency exercises
j. special events at sea or in port
k. emergency situations

5. The organization must be capable of functioning with a changing number of students each cruise because of student attrition or increased enrollment.
6. The training program must accomplish its tasks and reach its goals with the student in the conduct of three training cruises, where each student accrues approximately thirty weeks of actual experience in ship operation.
7. The training program will be written in a fashion, such that the program does not require the author or any other person familiar with it to be available for it to function. It will be self-contained and self-explanatory.
8. The program will be written so that the participating instructors need not be recognized teachers, members of the faculty or staff, for them to participate in some degree with the formal and informal instruction of the cadets.
9. The organization will be constructed according to present merchant vessel patterns rather than that of the U. S. Navy,

which is typical of other state maritime training ships.

10. The training program will be written with the cognizance that most of the practical experience the student will receive will be aboard the ship and not in a laboratory ashore.

11. Insofar as possible, the organization, the job descriptions and the training program itself will attempt to allow the student to actually perform all tasks required of all unlicensed personnel aboard merchant ships, and on the student's last cruise allow him full control of the entire engineering plant as will be required of him when he is licensed as an engineer.

The Proposal

The proposal for the training program was completed and submitted to the Superintendent of Texas Maritime Academy on August 31, 1964. The proposal was the first step of the procedure outlined in Chapter 1, and approval of the proposal was given after several weeks study. The proposal contained the framework of the organization to be used and contained most of the essential information relative to procedure, schedules and methodology. Using the proposal as a guide the final organization was written and is contained in the Officer-Faculty Guide. (The basic parts of the Guide are in Appendix B.)

The basic organization was written to conform to present merchant marine practice in that it afforded a system and methods which the student would later be able to identify when working as an engineer. Basically, the procedures, the jobs, and the relationships that are experienced by the students on other training vessels conform to merchant practice. However, there is added the naval schema of organization, job descriptions, and authority levels. By initially organizing the Engineering Department along merchant lines, no complications in control, discipline or job descriptions were anticipated; and the naval schema was not considered at all.

The job descriptions were written to conform to present merchant practice, by defining the duties and responsibilities usually held by officers and crew members. The student is an integral part of the Engineering Department of the training ship; because while holding the title and status of a student, he is also, in the fullest sense, a crew member of the vessel. It will be required of the sophomore student, with two semesters of freshman course work completed, with no previous experience, to function as a Fireman/Watertender the day he reports aboard. The New York State Maritime College provided no job descriptions for the cruise in 1963, Maine had none in 1964, and California publishes an extensive description which is applicable only to their present training ship. None of the foregoing practices were deemed suitable for TMA.

The watch and day work rotation schedules for in port and at sea were developed in the proposal and expanded upon in the final program. Original estimates accounted for a cruise of approximately ten weeks to be conducted, and that this figure would be somewhat standard. The cruise in 1963 with New York lasted 12.4 weeks, the cruise in 1964 with Maine lasted 9.8 weeks, and the California cruise of 1966 is scheduled for 11.6 weeks. The foregoing figures average to 11.3 weeks. The cruise in 1965 was scheduled for 10.8 weeks.

The rotation schedules ran for 72 days and could be very easily continued because the pattern for rotation is identifiable and repeats itself. The formal training program was scheduled and structured for only ten weeks to allow some flexibility in cases where it might be needed.

The formal training program to be used is divided into three phases, each phase attempting to transfer knowledge in a different way to give the student as complete an exposure to the subject matter as possible. The formal training program proposed is an extensive one relative to those in operation at other schools. It uses up a considerable portion of the cadet's time and makes heavy demands upon him in the matter of completed schedules and assignments. However, the justification for the program is an outgrowth of the success of the U. S. Merchant Marine Academy in prescribing eight hours of work and study assignments to be completed on the cadet's own time. The three phases of the proposed training program are as follows:

1. Each cadet will be assigned to a section in which will be

a number of sophomores, juniors and seniors. There will be six sections, each section assigned to a major job category aboard ship in the Engineering Department. These six job categories are:

a. 8-12 watch
b. 12-4 watch
c. 4-8 watch
d. maintenance section
e. machinist section
f. electrical section

Each section will be given a permanent letter assignment such as A, B, C, . . . etc. The rotation schedules will be constructed to rotate sections through the various job categories using the letter designator of each section as the operand. The schedule will be developed to rotate the sections at sea every three days, and another schedule developed to rotate the sections in port every day. The shifting from one schedule to another can be easily accomplished. While the cadet is in each job category he will be performing operations, processes, repair work, maintenance, overhaul, and developing skills necessary to keep the training vessel operating efficiently and safely, and will be actually doing them under the guidance of officer-instructors.

2. All the engineering cadets will attend a two hour lecture every day that the vessel is at sea. The lectures will

be held in the mornings and afternoons and will be given by available officer-instructors. The lectures are intended as informal gatherings where the students may have at their disposal an instructor to satisfy their curiosity about an assigned topic. The instructor is given an outline of the material pertinent to the student at his class standing. The lectures were considered necessary to give the student guided information about a particular subject, rather than to allow the student to pore through books to try to visualize or conceptualize certain information in a limited time period. Also, the lectures attempt to give the student some background in certain areas that are necessary for ship operation that are not covered as detailed in classroom work ashore. The lectures are independent of the rotation schedules, and no demands are made on the student in the way of testing over the lecture material.

3. Each engineering cadet will be required to complete ten written assignments dealing with information about plant operation and other engineering subjects. These assignments are formal and are graded, and are intended to be completed at the rate of one a week. The assignments are graded in difficulty, and after completing all three cruises, each cadet will have compiled a complete question

and answer manual on marine engineering plant operation. The ten assignments for each cruise are called a Sea Project, and will be completed in the cadet's own time.

The Officer-Faculty Guide

The Officer-Faculty Guide represents all the material that was developed for the conduct of the training program with some exceptions. Appendix B represents the major portions of the Guide to illustrate the form, format, and content. The exceptions noted above involved the development of the Engine Room Logbook, grade reports and work request blanks. Each officer, instructor and staff member of Texas Maritime Academy received a copy of the Guide for familiarization and guidance. Each engineering cadet received a "Cruise Book" which contained the organization, job descriptions, lecture title sheets and sea project applicable to his class, as it was printed in the Guide. In addition he also received the parts of the Guide relating to rotation schedules, grading system and maintenance pointers.

The Guide is made up of three sections which are further subdivided into seventeen parts. The nature and content of each of the parts is given below.

Section One

Part 1 - Letter of Promulgation

This letter from the Superintendent officially put the program into effect for the Academy.

Part 2 - Instructions

These instructions are for those who will participate as instructors in the program. Included is the type of training to be accomplished, use of the lectures, grading system and helpful hints.

Part 3 - Marine Engineering Safety Program

This part contains an introduction and three lecture outlines to be given to the entire department before departure to make each conscious of safety aboard ship.

Part 4 - Cruise Book Introductions

These introductions to each of the three classes participating in the cruise, outlined the requirements and use of the Cruise Book.

Part 5 - Training Program Organization

This organization of the department included organizational charts, time schedules, rotation schedules, illustrative examples as to total time spent in various activities and instructions for use.

Part 6 - Cadet Job Descriptions

Sufficient job descriptions were written to provide one for each student with expected enrollment of TMA for approximately three years.

Part 7 - Senior Class Lectures

These lectures consisted of a title sheet and an outline of material to be presented to the Senior Class aboard ship while at sea.

Part 8 - Junior Class Lectures

These lectures consisted of a title sheet and an outline of material to be presented to the Junior Class aboard ship while at sea.

Part 9 - Sophomore Class Lectures

These lectures consisted of the title sheets only for the lectures to be presented to the Sophomore Class aboard ship while at sea. Insufficient time prevented outlining these lectures and additional reasons are given in Part 2 (Appendix B).

Section Two

Part 10 - Sea Project Instructions

These instructions contained information on how to head papers, make drawings, acceptable styles, and information about due dates.

Part 11 - Senior Class Sea Project.

Part 12 - Junior Class Sea Project.

Part 13 - Sophomore Class Sea Project.

Section Three

Part 14 - General Watch Procedure

This is a general procedure for the conduct of each of the six watches stood every day, duties, and tasks to be performed by each cadet.

Part 15 - Specific Watch Procedure

This is specific information as to the duties and conduct of each particular watch.

Part 16 - Maintenance Pointers

This is a short treatise on the why's and how's of general maintenance.

Part 17 - Grades and Grading

This section contains instructions and information relative to the grades that are given for watch and day work, sea projects and final grades.

CHAPTER IV

PREPARATIONS FOR THE CRUISE

The preparations which were necessary for the cruise of 1965 were multitudinous, far reaching, involved many people and agencies, and took considerable time. The scope of the project is obvious, in that a training ship, like any other ship, is a floating city, providing all of the auxiliary services available to citizenry ashore. In addition it has the function of training, which is the realizable profit of a successful voyage.

The preparations were unique, and so unique that the likelihood of a similar situation to happen again would require the establishment of yet another maritime school for the education and training of officers. That likelihood is not foreseen at the present time, although rumors have existed in maritime circles for many years for schools in Maryland, Pennsylvania, and the state of Washington. Some of the factors which made this situation in Texas unique from the more immediate experience of other schools were:

1. The present training ships of the state maritime schools were all acquired while the ship was in operation under the ownership of a company or agency of the federal government.
2. The schools all had previous experience built up in their faculty and student body in the nature of training ship operation.

3. No records exist of any previous graduate work having been done on maritime training programs.
4. At the time of the initial preparations, Texas Maritime Academy had the fewest number of students available to make a cruise.
5. The Academy was forced by circumstance to use a vessel as a training ship which had been inactive and idle for six years.
6. The senior and junior cadets had previous experience on two different types of ships, and the T/S TEXAS CLIPPER would be the third type.
7. This was the first school of its type on the Gulf Coast, and therefore did not have the benefit of a maritime industrial community familiar with these schools to lend experienced advice.

The preparations in general, required the establishment of a completely new system of plans, controls, programs and decisions. All were untried and original to a large degree to suit the needs of TMA, Texas A&M University, the State of Texas and the U. S. Maritime Administration in Washington, D.C. The remainder of this chapter will be devoted to a broad sketch of the development of the program up to the point of departure to Halifax, Nova Scotia.

In August of 1964, the author wrote a manual describing the vital statistics of the S. S. ALCOA CLIPPER, the former passenger cargo ship of the Alcoa Steamship Company. The ship was laid up in the U. S. Maritime Administration Reserve Fleet at Bay Minette, Mobile, Alabama, and was an initial choice for a training ship by the U. S. Maritime Administration and the Superintendent of TMA. Also in August, the proposal for the training program was submitted and approved. During the Fall of 1964 considerable budgetary work was performed to outline the costs that were to be incurred for the cruise, and several budgets were submitted for discussion among department heads.

During November and December three faculty and staff meetings were held and the broad outlines of the cruise were established. At this time, the author presented the completed senior training program for review and evaluation, and described its functioning. Also, Assistant Professor James Hopkins was assigned to formulate the Deck Department Training Program using the organizational structure and schedules of the engineering program. In December the staff at the College Station office prepared a plan of procedure for the guidance of all concerned in the development of the cruise. That plan, labeled as a "Preparations Itinerary," is reproduced from the original and included in Appendix C. With minor deviation as to time of accomplishment, the itinerary held true through May 24, 1965.

In January 1965, permission was received from the Superintendent of TMA to send an inspection team from the Academy to the S. S. ALCOA CLIPPER to ascertain the desirability of the vessel as a training ship, and to determine the amount and kind of additional preparations that would be necessary. The inspection team consisted of Assistant Professor James Hopkins, Deck Training Officer assigned to be Second Mate of the training ship representing the Deck Department, and the author as Engineering Training Officer assigned to be First Assistant Engineer representing the Engineering Department. The inspection of the ship took place on Friday, January 25, 1965. On Sunday, January 27, a special staff meeting was called in Galveston, Texas and the findings related. On the basis of the arguments of the inspection team the vessel was judged undesirable, and a new search for a suitable vessel was begun. The Maritime Administration was contacted, and on February 5, the same inspection team arrived at Stoney Point on the Hudson River, New York, to inspect the S. S. EXOCHORDA and S. S. EXCAMBION.

The training ships for the state maritime academies are loaned by the federal government through the U. S. Maritime Administration of the Department of Commerce to the school as long as the school is satisfied with it and no national emergency requires its return. Each school is given a maximum of $75,000 for operations by the federal government, with additional funds supplied by the state in which the school resides. The first ship which an academy acquires is also given an appropriation of $250,000 to cover costs of outfitting and refurbishing. The $250,000 is awarded only once and is not available when academies change ships. The inspection team inspected the S. S. EXOCHORDA and the S. S. EXCAMBION and after consultation with Maritime Administration officials and the Superintendent and staff at Galveston, the EXCAMBION was chosen for the following reasons:

1. The S. S. EXCAMBION ceased operations as a passenger cargo liner in the Spring of 1959 and was preserved and laid up under priority standards. All equipment and appurtenances were either operating or in good condition before preservation techniques were applied.
2. The EXCAMBION had facilities for 30 additional passengers in quarters that were visually in better condition.
3. The hull and shell plating of the EXCAMBION were visually in much better condition, with the visible hull judged excellent for the ship's age.
4. The electrical generating plant and the other electrical equipment and wiring on the EXCAMBION were preserved and these preservative measures rendered the systems generally in good condition.
5. The evaporator capacity of the EXCAMBION allowed longer voyages and less dependence on water carried in ship's tanks.

Additional considerations were made relative to food storing and cooking facilities, office space, classroom space, eating facilities, ventilation and air conditioning systems, electrical generating capacity, cargo gear type and condition, painting required initially internal and external, refrigeration capacity and standby equipment, amount and type of automatic equipment to maintain, simplicity and/or difficulty of operation, the remaining useful life of the vessel, the amount of work that could be accomplished for $250,000, and the possibility of housing the cadets aboard the vessel on a permanent year-round basis.

Very little data was available about the EXCAMBION, and the job of outfitting her became extremely difficult and arduous. The author became responsible for ordering the Engineering Department supplies and materials, which eventually amounted to an order of over 700 different types of items.

The purchase requisition went out on bid to marine suppliers. The total requisitions ran in scope from brooms and toilet paper to tools, food, hawser, boiler water chemical treatments, erasers, chalk, books, blackboards, packing, gasketing, refractory materials, oxy-acetylene torches, charts, sextant, electrical motors and the outfitting of the ship's hospital which has an operating room.

The ordering, preparation of purchase orders, processing and initial delivery were all accomplished by June 1, 1965. In the meantime, the Officer-Faculty Guide and Cruise Books for the Engineering Department had been printed and distributed and the ship's overhaul contract had been awarded to Todd Shipyards of Galveston. The ship was towed to Galveston, arriving on Sunday, May 16, 1965. Work began immediately on the vessel; and virtually every piece of equipment and system was opened, inspected, closed up and tested. The student body reported aboard on Monday, June 7, 1965, and the In Port Watch Schedule of the

Engineering Department Training Program was put into effect at 0800 with James W. Brady as the Cadet Engineer.

Additional memorandums and notices which were deemed necessary to the smooth functioning of the Engineering Department are included in Appendix C to serve as models for future use.

CHAPTER V

THE CRUISE

The Officers of the T/S TEXAS CLIPPER assembled in Galveston on June 1, 1965 to complete the preparations for the cruise. Chief Engineer Hugh F. Giblin and the author as First Assistant Engineer were responsible for the supervision and evaluation of the shipyard overhaul of the CLIPPER, and Second Assistant Manges, Third Assistant French and Fourth Assistant Mercer stood eight hour watches aboard the ship to help make plant preparations. The cadets were put on In Port watches on June 7, and attempts were made to start up the power plant.

At Galveston

Considerable difficulty was encountered in starting up. None of the equipment had been in operation for six years, and the overhaul was done with little knowledge of the specific equipment, a pressed time schedule and a lack of experienced personnel to do the work in the time available. Quite a number of agencies had to be satisfied with the safety and reliability of the vessel before she would be allowed to sail, among whom were the U. S. Maritime Administration, the U. S. Coast Guard, the Federal Communications Commission, and the American Bureau of Shipping. Because of the difficulties encountered, the ship was delayed two weeks from her scheduled sailing day of June 14, 1965.

Some of the specific difficulties encountered are described below, not for the value of the information itself, but as partial justification for decisions made relative to the training program and its functioning during the cruise later on.

The boilers used to generate steam aboard the ship require distilled water with a low solids content and chloride purity at 0.1 grains per gallon. The water available at Galveston was 12-30 grains per gallon, and as a result the boilers had to be subjected to considerable purification procedures and chemical treatment to prevent damage to the boiler heating surfaces. U. S. Navy specifications for the same type of boiler recommends not exceeding 30 gpg for emergency operation, and salinities as high as 250 gpg were experienced. The problem of distilled water was further complicated by the fact that the motors for the brine and condensate pumps for the evaporators grounded out completely, thereby rendering the ship incapable of distilled water production. These problems were eventually overcome but at the expense of time and much labor.

The electrical generators for the ship exhibited radical operation both from the units themselves as well as the supporting condensing and air removal equipment. The generators tripped themselves off the line for a variety of reasons and the entire plant went dead more than fifteen times before departure, and as many as four times one particular day. The situation of a plant going dead is tenuous at best and dangerous. All lights, electrical motors and systems cease to function and there was considerable apprehension over the spoilage of thirty tons of frozen and refrigerated food which had no compressors serving the refrigeration system. Also, there were no lights anywhere on the ship, which was dangerous for people moving about, especially in an equipment-filled engine room.

Many of the pumps and fluid systems, already twenty years old, exhibited considerable difficulty before they would function adequately for as much as two days before work had to be done on them. Main feed pumps blew out their packing; pipe nipples and rags were found in one main condensate pump; one pump had been packed with rags; leak off piping was corroded; sanitary piping chocked with rust and scale; sealing surfaces wasted away in bilge, bilge and ballast and general service pumps; solenoid valves frozen open or shut in refrigerant systems; expansion valves would not work; and reefer condenser circulating pumps could not supply sufficient cooling water. The overhaul contract called for opening inspection and closing up of equipment, but money was not available for replacement outside of the ship's spare parts inventory. The ship's inventory was sparse.

During the weeks in June, considerable effort was exerted by all to bring the ship to operating condition. Two abortive attempts were made to actually leave Galveston; however, the first time the distilled water in hand became contaminated, and on the second try the engine room ventilation circuit breaker became inoperative; as a result, engine room temperature reached 135 degrees F. and two cadets suffered heat exhaustion. The problem of operation was acute during the first weeks; however, the experience gained by the Engineering Department was invaluable later on.

Despite the lack of experience among the officers with this type of vessel, plus twenty cadets in the learning stages from none to twenty weeks sea time, once the plant was on the line, each did remarkably well in adjusting to the situation and performing beyond expectations. The sophomore cadets were outstanding, in that, in two weeks of completely radical operation, they literally mastered the skills necessary to fire and tend water for both boilers without the aid of any automatic equipment and with little or no supervision. During the month of June all the members of the Engineering Department were working 16-20 hours a day and at times two days straight. The In Port and At Sea watches were used continually, but no lectures as Sea Projects were completed.

To help the Engineering Department, Lykes Steamship Company loaned the Academy the services of Chief Engineer Gobrowski who will be remembered for his tireless efforts to bring the bilge system into operation. He made the trip as far as Halifax, Nova Scotia.

Underway

On July 1, 1965 there was sufficient distilled water and confidence in the operation of the plant to get underway and the CLIPPER finally ventured out into the Gulf of Mexico. Because of the work required to keep the plant in operation and to bring other equipment into operation, no lectures were held; however, the work on the Sea Project did begin. There was one major breakdown off Miami, when a primary cooling water line to the main boiler feed pumps failed. During the passage to Halifax, the At Sea schedules proved themselves and there were no conflicts, no one missed any watches and little or no administrative work was necessary to guide the cadets or the officers.

Upon arrival in Halifax, the In Port watch schedule was put into effect with no problems. Again considerable boiler purification procedures were necessary and "blowing down" both boilers required as much as eight hours per boiler. Considerable difficulty was experienced with condensate pumps and the refrigeration system, and galley equipment was erratic. In all cases the cadets were on the job sight or actually performing the tasks necessary to preserve the safety and health of all aboard. The assignment of the three day working sections proved of immeasurable value in the matter of gaining practical experience, solving complicated operational procedures, and keeping the ship moving.

The first day at sea after departing Halifax, lectures were begun for all the juniors and seniors. The author had decided that the practical experience available to the sophomores was more beneficial to the Department than the lectures could have been. The lectures did interrupt the progress of day work in the afternoons, but for about a week nothing critical happened and it was accepted as part of the routine. Lectures for the sophomores were started later, but were scheduled for the evenings. Although the officer-instructors were working two watches a day, plus extra time when necessary, and were preparing and holding two hour lectures per day, no complaints were registered. Comments were made, however, that the lecture outlines helped considerably. It was found that the jobs of First Assistant Engineer and Engineering Training Officer proved too much for this first cruise. The lectures themselves were no problem, but the job requirements of First Assistant did not allow enough time to lecture. After an evaluation of the cadets' progress up to arrival in Copenhagen, no further formal lectures were held for the following reasons:

1. The original schedule provided for five officer-instructors to lecture, and only three had time enough to perform this collateral duty.
2. Without five instructors lecturing not all cadets would receive instruction.
3. Because of the nature of this first cruise and the unique problems at hand, the on-the-job experience was considered more valuable at this time.
4. The experiences shared were unique to the point that deliberate duplication of these events for instructional purposes on later cruises would endanger the safety of the ship and its crew.

All of the remaining ports-of-call were made on time according to a revised schedule. The CLIPPER sailed from Copenhagen to Edinburgh

Scotland, to Southampton England, to Hamilton, Bermuda, and then back to Galveston with a stop at Miami to pick up Texas A&M University representatives.

The CLIPPER arrived at Pier 19 Galveston, Texas at 1600 hours August 22, 1965. Official Leave for the cadets commenced at 1600 hours Monday, August 23, 1965 and the watch schedules ceased at that time. Additional help was received from Senior Cadet Joseph Henry Schmidt and the entire engineering plant was shut down by 2200 hours. The first cruise of the Texas Maritime Academy aboard the T/S TEXAS CLIPPER was over.

Evaluation

The Sea Projects were not submitted weekly as planned because of the extenuating circumstances. Most of the cadets did not get a real start into the assignment until after Halifax, and by that time the original schedule of weekly completions did not hold for a completed Sea Project at the end of the cruise. A tabular description of the assignments completed is given in Table 1.

Out of the total 200 assignments, 139 were completed and graded. This gives a percentage of 69.5% completed, or the average number of assignments per cadet of 6.95. The original cruise was planned for about ten weeks or 70 days, and the actual cruise time spent away from Galveston was 56 days. The actual cruise was only 80% of the estimated length of time and considering the unique and extenuating circumstances surrounding the cruise, the work completed is in fair agreement to the "normal" time that was available for its completion. Stated another way, of the 8 weeks (56 days) available for the completion of the Sea Project, the average number of assignments completed per cadet was approximately 7, or 87.5% of the originally planned work to be completed per week. This would seem to indicate that the Sea Projects are possible as planned for, and given more "normal" conditions would be entirely possible within the work schedules laid out in this program.

The distribution of actual assignment numbers completed for all Sea Projects for all cadets is given in Table 2. It can be seen that all 20 cadets completed assignments #1 and then as time went by the relative abilities of the cadets becomes evident in a relatively smooth cumulative ogive curve which could be plotted from the data.

Table 3 gives a distribution of final grades for all the cadets and for each class. The final grades were computed and letter grades assigned. The lectures, while they were held, proved feasible in so far as scheduling and content are concerned. It was found, however, that some of the material in the senior lectures was repetitive for this senior class, in that the author had covered similar subjects on the cruise with Maine in 1964. Since the lectures for all the classes are now assigned by title and content, repetition will be held to a minimum for succeeding classes.

The actual watch and day work experience that the cadets and the officers had this cruise is beyond the usually expected variation

TABLE 1

SEA PROJECT ASSIGNMENTS COMPLETED
(For All Sea Projects and All Cadets)

1. Total number of Engineering Cadets 20

2. Total number of Assignments per Sea Project 10

3. Total number of Assignments (1 x 2). 200

COL. 1 NO. OF ASSIGNMENTS COMPLETED PER SEA PROJECT	COL. 2 DISTRIBUTION OF THE NO. OF CADETS	COL. 3 COL. 1 x COL. 2
1	0	0
2	1	2
3	2	6
4	1	4
5	2	10
6	2	12
7	2	14
8	4	32
9	1	9
10	5	50
Total number of assignments completed		139

of occurrences of a professional engineer's experience. Every conceivable type of emergency was experienced, with some completely foreign and unheard of to the Chiefs Giblin and Gobrowski and the author. The total complement of professional seamen and officers usually aboard the CLIPPER in commercial trade was 19, and for this last cruise there were 25. The cadets had to perform the jobs and tasks that were usually required of professional seamen, and the fact that the ship did sail and came back with all systems in operation is credit to their initiative, their abilities, their fortitude, and cooperation.

TABLE 2

DISTRIBUTION OF THE ACTUAL ASSIGNMENT NUMBERS COMPLETED FOR ALL SEA PROJECTS AND ALL CADETS

ASSIGN. NO.		NO. OF CADETS COMPLETING THE ASSIGNMENT NO.
1		20
2		19
3		19
4		15
5		15
6		13
7		12
8		9
9		9
10		8
	Total Assignments Completed	139

TABLE 3

DISTRIBUTION OF FINAL GRADES

"A"
All Cadets

GRADE	NO. OF CADETS
A	4
B	7
C	8
D	1
F	0

"B"
Sophomores

GRADE	NO. OF CADETS
A	1
B	2
C	3
D	1
F	0

"C"
Juniors

GRADE	NO. OF CADETS
A	3
B	3
C	0
D	0
F	0

"D"
Seniors

GRADE	NO. OF CADETS
A	0
B	2
C	4
D	0
F	0

CHAPTER VI

CONCLUSIONS AND RECOMMENDATIONS

The process for developing the organization and training program, and the process of acquiring and outfitting of a training ship posed many problems, some seemingly insurmountable. The unique situation confronting everyone connected with the Academy will doubtless find no equal, nor will a similar situation ever happen again. The strength of the foregoing statement is justifiable from the point of view that this study will be the first guide of its kind to set criteria and provide a method of training engineers for the American Merchant Marine. This study then, is a case situation which hopefully will temper future action with comparative results and actions.

Conclusions

Any conclusions that may be drawn from the first trial of the program in the summer of 1965, do not find support in any comparative data, no statistics, and no experimental results. The conclusions that will be drawn, however, will not be entirely intuitive but will be based on observations of the author who has experienced and participated in three different kinds of programs.

The conclusions of this study refer only to the Texas Maritime Academy Engineering Training Program and the engineering programs of the other nautical schools, and are as follows:

1. It is possible to conduct almost three times as many lectures as the other state maritime schools.
2. It is possible to have the students complete written assignments of a greater scope and of a greater amount than the other state maritime schools.
3. With a heavier lecture schedule and increased written assignments the normal operation of the ship was not noticeably affected.
4. The system of sections and the rotation schedules prescribed will function with a minimum number of cadets even under arduous and extremely dangerous and fluctuating engineering conditions. Also, the schedules are self-sustaining requiring no outside administrative guidance except in the decision necessary to affect a change from sea watches to port watches.
5. It was shown that the lectures were possible, that the lecture outlines were a definite help to the officer-instructors and that the time and place for the lectures needed no administrative guidance or scheduling.
6. It was shown that the instructions to the cadets and the officer-instructors were self-explanatory and provided no conflicts or misinterpretations during the first cruise. Also, because of the last statement, it is surmised that

the publication of complete manuals for the officers to follow, and complete manuals for the cadets was of mutual benefit to all concerned.

7. From comments of cadets and officers it was shown that the specific work divisions into job categories, and the three day period spent in each in the rotation schedule, helped the cadets become familiar with the routines, jobs and skills necessary to perform the work required in each category.

8. The grading system and the administrative work necessary in compilation and averaging of grades was simple and did reflect the abilities of the cadets relative to each other and to the demands placed upon them.

9. The study showed that the creature comforts of the cadets and officers were respected and that the training program did not interfere with and/or was flexible enough to adjust to special circumstances and events.

10. The functioning of the training program concurrent with the operation of the ship would not have been possible without all of the prior planning and developmental work. With the criteria under which the program was constructed, it afforded a flexibility sufficient to deal with even the most severe deflections from a "normal" situation for which it was intended.

In summary, the basic conclusion which can be derived from this first trial of the first training program on the first cruise of Texas Maritime Academy, is that generous increases in the amount of formal and informal training can be made using a plan of procedure, criteria to guide the development of the program, and using the form and format suggested in this study.

Recommendations

The proof that this program is better is shown only in the fact demonstrated that additional time and work can be allotted to the exclusive function of training. However, it has not been shown whether the student is actually more conversant with the operation of a vessel relative to the programs of the other schools. Recommendations for comparative statistical studies to be conducted are difficult to make under existing conditions. The present curricula and programs in existence are so varied that the student at the end of his education is the only reliable source of data. Because no students have yet graduated from Texas Maritime Academy, no data was available at this time. Also, because so few students are enrolled, student-teacher ratios are very low, and the confusing and varied experience of the first engineering student body, it is not likely that significant results can be obtained.

If one proceeds from the basic fact shown in this study that additional training time is available, it can be assumed that this program can be used to a distinct advantage in the improvement of the training of maritime engineering students. The first cruise is over and experience is at hand in the way of the participants who will make the next cruise. The recommendations which follow, are those which pertain to the ship and the training program which are thought to be necessary for the conduct of the cruise in 1966, and possibilities for the future.

1. A "Preparations Itinerary" should be developed by the Faculty and Staff of the Academy to guide all concerned to the completion of all necessary tasks to conduct the cruise in 1966.
2. Operating budgets should be developed for each department for use in planning acquisitions for the coming cruise.
3. Serious efforts should be made to acquire visual-aid material for presentation during the cruise and as ready sources of information during the academic year.
4. The training program should come under the cognizance of an Engineering Training Officer whose sole function in the ship should be training, and should not have collateral duties of any major nature.
5. The lecture outlines and Sea Projects should be reviewed and edited to reflect development, extraction of extraneous material, and opinion and advice of the total faculty in the Engineering Department.

6. A committee should be appointed to oversee the entire training program and its continued development relative to the curriculum, progress in the industry, and the developments in training at the other maritime schools.

7. A study should be conducted to explore the academic and budgetary possibilities of presenting the lecture material and the Sea Project in the way of programmed instruction with the use of some form of teaching machine. This possibility would relieve officers of direct teaching responsibilities so that their time can be more fruitfully used in the operation of the ship. Also, the clerical and administrative load of grading would be simplified. For the cadet, it would provide a self-pacing, self-correcting source of instruction. The matter of compiling review information for the license examination would become a prime consideration, however, because no written work, per se, would be available to the cadet at the end of the cruises.

B I B L I O G R A P H Y

BOOKS

Accident Prevention Manual for Industrial Operations. Fifth Edition. Chicago: National Safety Council, 1964.

Althouse, Turnquist, Bowditch. Modern Welding. Homewood: Goodheart-Wilcox Co., Inc., 1965.

Arnott, David, Ed. Design and Construction of Steel Merchant Ships. New York: Society of Naval Architects and Marine Engineers, 1955.

Baker, Elijah. Introduction to Steel Shipbuilding. Second Edition. New York: McGraw-Hill Book Company, 1953.

Barr, Hugh. MacGibbon's M.O.T. Orals and Marine Engineering Knowledge. Twelfth Edition. Glasgow: James Munroe & Company, Limited, no date.

Bischoff, L. P. Naval Reciprocating Engines. Annapolis: U. S. Naval Institute, 1929.

Bradford, Gibb and Benne, Ed's. T-Group Theory and Laboratory Method. New York: John Wiley and Sons, Inc., 1964.

Bross, Steward R. Ocean Shipping. Cambridge: Cornell Maritime Press, 1956.

Burghardt, Henry D. and Axelrod, Aaron. Machine Tool Operation Part 1 and 2. Fourth Edition. New York: McGraw-Hill Book Company, 1953.

Burton, Malcolm S. Applied Metallurgy for Engineers. New York: McGraw-Hill Book Company, 1956.

Clark, G. H. Marine Lubrication. New York: Simmons-Boardman Publishing Corporation, 1959.

Constance, John D. Mechanical Engineering for Professional Engineers' Examinations. New York: McGraw-Hill Book Company, Inc., 1962.

Cornell, Felix and Hoffman, Allan. American Merchant Seaman's Manual. Fifth Edition. Cambridge: Cornell Maritime Press, 1957.

Coulson, John E. Editor. _Programmed Learning and Computer Based Instruction_. New York: John Wiley and Sons Inc., 1962.

Croft, Terrell. _Electrical Machinery Principles, Operation and Management_. Fourth Edition. New York: McGraw-Hill Book Company, 1938.

Croft, Terrell, Ed. _Steam Power Plant Auxiliaries and Accessories_. Second Edition. New York: McGraw-Hill Book Company, 1946.

Crouch, Holmes. _Nuclear Ship Propulsion_. Cambridge: Cornell Maritime Press, 1961.

Csanady, G. T. _Theory of Turbomachines_. New York: McGraw-Hill Book Company, 1964.

Dawes, Chester L. _Industrial Electricity_. Volume I and II. Third Edition. New York: McGraw-Hill Book Company, 1956.

Elden, Rodney M. _Ship Management_. Cambridge: Cornell Maritime Press, 1962.

Elonka, Steve. _Plant Operator's Manual_. New York: McGraw-Hill Book Company, 1956.

El-Wakil, M. M. _Nuclear Power Engineering_. New York: McGraw-Hill Book Company, 1962.

Estrin, Herman A. Editor. _Higher Education in Engineering and Science_. New York: McGraw-Hill Book Company, 1963.

Fitzgerald, A. E. and Higginbotham, David E. _Basic Electrical Engineering_. Second Edition. New York: McGraw-Hill Book Company, 1957.

Forbes, Pope and Everitt. _Lubrication of Industrial and Marine Machinery_. New York: John Wiley & Sons, Inc., 1954.

Ford, Louis R. _Practical Marine Diesel Engineering_. New York: Simmons-Boardman Publishing Corporation, 1943.

Fox, W. J. and McBirnie, S. C. _Marine Steam Engines and Turbines_. London: George Newnes Limited, 1961.

Giachino, J. W. and Gallington, Ralph O. _Course Construction in Industrial Arts and Vocational Education_. Second Edition. Chicago: American Technical Society, 1961.

Gill, Smith and Ziurys. Fundamentals of Internal Combustion Engines. Fourth Edition. Annapolis: U. S. Naval Institute, 1959.

Graham, R. P. and Cragg, L. H. The Essentials of Chemistry. New York: Holt, Rinehart and Winston, 1956.

Heinrich, H. W. Industrial Accident Prevention, A Scientific Approach. Fourth Edition. New York: McGraw-Hill Book Company, 1959.

Hempel, J. C. Ed. Your Ship and It's Maintenance. Copenhagen: J. C. Hempel's Foundation, 1963.

Henry Ford Trade School. Shop Theory, Revised Edition. New York: McGraw-Hill Book Company, Inc., 1942.

Herkimer, Herbert. Engineers' Illustrated Thesaurus. New York: Wm. Penn Publishing Corp., 1952.

Hickey, Henry V. and Villines, William M. Elements of Electronics. Second Edition. New York: McGraw-Hill Book Company, 1961.

Hicks, Tyler. Pump Operation and Maintenance. New York: McGraw-Hill Book Company, 1958.

Historical Transactions 1893-1945. New York: Society of Naval Architects and Marine Engineers, 1945.

Hohman, Elmo Paul. History of American Merchant Seamen. Hamden Conn: The Shoe-String Press, 1956.

Johnson, Carl G. and Weeks, William R. Metallurgy. Fourth Edition. Chicago: American Technical Society, 1956.

Jordan, Richard C., and Priester, Gayle B. Refrigeration and Air Conditioning. Second Edition. Englewood Cliffs: Prentice-Hall, Inc., 1956.

Karassik, Igor J. Engineers' Guide to Centrifugal Pumps. New York: McGraw-Hill Book Company, 1964.

Karassik and Carter. Centrifugal Pumps. New York: McGraw-Hill Book Company, 1960.

Kates, Edgar. Diesel and High-Compression Gas Engines Fundamentals. Second Edition. Chicago: American Technical Society, 1965.

Kearton, William J. Steam Turbine Operation. Seventh Edition. London: Sir Asaac Pitman & Sons Ltd., 1964.

Kerchove, Rene de. International Maritime Dictionary. New York: D. Van Nostrand Company Inc., 1948.

King, Reno C. Practical Marine Engineering. Englewood Cliffs: Prentice-Hall, Inc., 1956.

Kirk, Franklyn and Rimboi, Nicholas. Instrumentation. Chicago: American Technical Society, 1962.

Knight, Austin M. Modern Seamanship. Twelfth Edition. New York: D. Van Nostrand Company, Inc., 1953.

Kramer, C. W. Nuclear Propulsion of Merchant Ships. Prepared under the auspices of the Division of Technical Information, U. S. Atomic Energy Commission. Washington D. C.: U. S. Government Printing Office, 1962.

La Dage, John H. Modern Ships. Cambridge: Cornell Maritime Press, 1953.

La Dage, John and Van Gemert, Lee. Stability and Trim for the Ship's Officer. Second Edition. New York: D. Van Nostrand Company Inc., 1956.

Lane, Frederic C. Ships for Victory, A History of Shipbuilding Under The U. S. Maritime Commission in World War II. Baltimore: The John Hopkins Press, 1951.

Latham, Robert F. Introduction to Marine Engineering. Annapolis: U. S. Naval Institute, 1958.

Latham, Robert F. Naval Boilers. Annapolis: U. S. Naval Institute, 1956.

Lorenzi, Otto de. Combustion Engineering. New York: Combustion Engineering, Inc., 1953.

Maleev, V. L. Diesel Engine Operation and Maintenance. New York: McGraw-Hill Book Company, 1954.

Manifold, George O. Automatic Control for Power and Process. New York: McGraw-Hill Book Company, 1964.

Margulies, Stuart and Eigen, Lewis D. Applied Programed Instruction. New York: John Wiley and Sons, Inc., 1962.

McGehee, William and Thayer, Paul W. Training in Business and Industry. New York: John Wiley and Sons, Inc., 1961.

Metcalfe, James Vernon. The Principles of Ocean Transportation. New York: Simmons-Boardman Publishing Corporation, 1959.

Milton, J. H. Marine Steam Boilers. London: George Newnes Limited, 1961.

Moseley, Nicholas. Teacher's Manual for Military, Marine, Vocational and Industrial Training. New York: Cornell Maritime Press, 1943.

Naval Machinery. Annapolis: U. S. Naval Academy, 1946.

Naval Turbines. Annapolis: U. S. Naval Academy, 1952.

Neild, A. B. Ed. Modern Marine Engineer's Manual. Volume I. Second Edition. Cambridge: Cornell Maritime Press, 1965.

Noel and Chandler. The Watch Officer's Guide. Annapolis: U. S. Naval Institute, 1953.

Obert, Edward F. Internal Combustion Engines Analysis and Practice. Second Edition. Scranton: International Textbook Company, 1950.

Osbourne, Alan, Ed. Modern Marine Engineers Manual. Volume I and II. Cambridge: Cornell Maritime Press, 1941.

Payne, C. M. Naval Turbine Propulsion Plants. Annapolis: U. S. Naval Institute, 1958.

Perry, John H. Ed. Engineering Manual. New York: McGraw-Hill Book Company, 1959.

Potter, Philip J. Power Plant Theory and Design. Second Edition. New York: The Ronald Press Company, 1959.

Rimington, Critchell. Merchant Fleets, A Survey of Merchant Navies of the World. New York: Dodd, Mead & Company, 1944.

Rogers, T. Howard. The Marine Corrosion Handbook. New York: McGraw-Hill Book Company, 1960.

Rose, Homer C. The Development and Supervision of Training Programs. Chicago: American Technical Society, 1964.

Rushbrook, Frank. Fire Aboard. New York: Simmons-Boardman Publishing Corporation, 1961.

Scheel, Lyman F. Gas and Air Compression Machinery. New York: McGraw-Hill Book Company, 1961.

Schilling, Eugene W. Electrical Engineering. Scranton: International Textbook Company, 1960.

Schwenk, Shannon and Skrotski. Nuclear Power Engineering. New York: McGraw-Hill Book Company, 1957.

Seward, Hubert Lee. Editor. Marine Engineering. Volume I and II. New York: Society of Naval Architect and Marine Engineers, 1962.

Shulters, Earl S. Marine Air Conditioning and Refrigeration. Cambridge: Cornell Maritime Press, 1952.

Steam. Thirty-seventh Edition. New York: Babcock & Wilcox Company, 1960.

Shields, Carl D. Boilers, Types, Characteristics, and Functions. New York: F. W. Dodge Corporation, 1961.

Skrotski, Bernhardt G. A., and Vopat, William A. Power Station Engineering and Economy. New York: McGraw-Hill Book Company, 1960.

Stinson, Karl W. Diesel Engineering Handbook. Stamford: Diesel Publications, Inc., 1963.

Thomas, R. Murray and Swartout, Sherwin G. Integrated Teaching Materials. New York: David McKay Company Inc., 1963.

Timbie, William H. The Elements of Electricity. Third Edition. New York: John Wiley & Sons, Inc., 1937.

Tracy, Stephen J. Jr. How to Solve Problems in Steam Power Engineering. New York: Thomas Y. Crowell Company, 1948.

Turner, Rufus P. Basic Electricity. New York: Holt, Rinehart and Winston, 1963.

U. S. Navy Bureau of Naval Personnel. Basic Electricity. Washington D. C.: U. S. Government Printing Officer, 1960.

U. S. Navy Bureau of Naval Personnel. Principles of Naval Engineering. Washington D. C.: U. S. Government Printing Office, 1958.

U. S. Public Health Service and the War Shipping Administration. The Ship's Medicine Chest and First Aid at Sea. Washington D. C.: U. S. Government Printing Office, 1947.

Villiers, Alan. Men, Ships and the Sea. Washington D. C.: National Geographic Society, 1962.

Zeines, Ben. Servomechanism Fundamentals. New York: McGraw-Hill Book Company, 1959.

PAMPHLETS

Alternating-Current Marine Motors and Control Equipment, Instructions GEI-18517. Schenectady: General Electric Company, December, 1945.

American Society of Mechanical Engineers. ASTM-ASME Recommended Practices for the Flushing and Cleaning of Marine Propulsion Turbine Lubricating Systems, ASME Standard No. 113. New York: A.S.M.E. United Engineering Center, 1964.

Ameroid Marine Division. Chemical Analysis of Water. New York: Drew Chemical Corporation, no date.

California Maritime Academy. "Department of Marine Engineering Instruction Book." Sea Training Trimester, 1959.

Care and Operation of Babcox & Wilcox Marine Boilers. New York: Babcox & Wilcox Company, 1942.

Catalog 1964-1965. Bronx, New York: State University of New York Maritime College, 1964.

Catalogue 1965-1966. Vallejo: California Maritime Academy, 1965.

Centrifugal Pump Fundamentals. New York: Ingersoll-Rand, Pump Division, no date.

Drew & Co., Inc. Industrial Water Analysis. New York: Power Chemicals Division, C. F. Drew & Co., Inc., no date.

Dwyer, R. C. Marine Steam Engineering. Book III: Reciprocating Engines. New York: D. Van Nostrand Company Inc., 1941.

Galveston Chamber of Commerce. A Presentation of the Need for a Maritime Academy in Texas. Submitted by Capt. S. B. Wetmore, Chairman of the Proposed Merchant Marine Academy Committee for review by the Texas Commission of Higher Education, 1959.

Ingalls Shipbuilding Corporation. Engineer's Operating Manual for Single Screw Cargo Vessel Design C4-S-1a. Pascagoula: U. S. Department of Commerce, Maritime Administration, 1952.

Instructions For Installation, Operation and Maintenance of G-R Low-Pressure Distilling Plants, Bulletin 317. Massillon, Ohio: Griscom-Russell Co., 1952.

Marine Auxiliary Electric Drives. Pittsburgh: Westinghouse Electric Company, no date.

Marine Boilers Bulletin M-4-B. New York: The Babcock & Wilcox Company, 1948.

Marine Engineer's Beneficial Association. Basic Hydraulics for Marine Engineers. New York: MEBA District 1 & 2, no date.

Marine Fuels and Lubricants. New York: Gulf Oil Corporation, 1962.

Marine Lubrication-Auxiliaries. New York: Socony-Mobil Oil Company, 1961.

Marine Lubrication-Motorships. New York: Socony Mobil Oil Company, 1964.

Marine Lubrication-Steam Turbines. New York: Socony Mobil Oil Company, 1960.

McCready, Lauren S. "Marine Engineering Instruction in the Modern Age," paper presented before the New York Metropolitan Section of the Society of Naval Architects and Marine Engineers at the U. S. Merchant Marine Academy, 16 April 1964.

National Research Advisory Committee. "Role of the U. S. Merchant Marine in National Security," Project Walrus Report by the Panel on Maritime Use of the U. S. Merchant Marine in Volume 2 of the Proposed Program for Maritime Administration Research. Washington D. C.: National Academy of Sciences - National Research Council, 1960.

O'Hara, Walter J. Mariner's Firefighting Manual. Kings Point: U. S. Merchant Marine Academy, no date.

United States Coast Guard. Rules and Regulations for Manning of Vessels, Subchapter P, CG-268. Washington, D. C.: U. S. Government Printing Office, February 1, 1963.

U. S. Department of Commerce "Maritime Resources for Trade and Security," report of the Maritime Evaluation Committee to the Secretary of Commerce Luther H. Hodges, January, 1963.

U. S. Maritime Administration. Review of Merchant Marine Personnel Training Program. Washington D. C.: U. S. Department of Commerce, April, 1955.

U. S. Navy Bureau of Ships. Navyships 250-000 Technical Manual. Vol. I, II, III. Washington D. C.: Government Printing Office, October, 1963.

U. S. Treasury Department. U. S. Coast Guard Rules and Regulations for Licensing and Certificating of Merchant Marine Personnel, Subchapter B, CG 191. Washington D. C.: U. S. Government Printing Office, July 1, 1963.

Walls, W. A., and Proctor, W. S. Reduction of Fireside Deposits in Marine Boilers. Philadelphia: The Atlantic Refining Company, 21 October 1960.

PERIODICALS

American Marine Engineer. May, 1964.

Johnson, William B. "Crisis in Transportation Education." National Defense Transportation Journal, Nov.-Dec., 1962.

Mattson, Howard A. "In Our Opinion." Editorial. International Science and Technology. No. 30, June, 1964.

Perry, E. B. "Shipboard Automation: How Much is Enough?" Navy Magazine of Sea Power. June, 1964.

Ware, Bob. "Editorial Log." Marine Engineering/Log. Vol. LXX, No. 9, August, 1965.

OTHER

Fixman, Carl. Personal Correspondence.

Tangerini, C. Personal Correspondence.

Texas Maritime Academy. A Self Study. Mimeographed, no date.

A P P E N D I X A

1964 CRUISE TRAINING PROGRAMS

TEXAS A&M UNIVERSITY
TEXAS MARITIME ACADEMY
College Station, Texas

13 April 1964

To: Captain Bennett M. Dodson USN (Ret)
Superintendent, Texas Maritime Academy

From: Lt. Klaus V. Luehning
Engineering Training Officer

Subj: Sea Training Cruise Spring, 1964
Final Engineering Report

During the week of 2 February I investigated the training program for the Engineering Cadets of Maine Maritime Academy, which was to be followed by the Engineering Cadets of Texas Maritime Academy. I found that the training program was a haphazard method of watch standing, unsupervised training periods, and inefficient maintenance procedures. No formal classes were held and no organizational procedures were available.

I made up Sea Projects for both the Sophomore and Freshmen classes copies of which are attached. I also scheduled classes for both Sophomores and Freshmen at times when I was off watch. Each class consisted of a lecture and a question and answer session following. Each class ran for approximately two hours. The classes were held each day at sea and when the ship was at anchor. Total class time for the Engineers for the Cruise was approximately 80 hours, or the equivalent of twenty weeks of a 4 semester hour credit course. The subject areas covered were as follows:

marine turbines
marine gears
marine boilers
steam and water cycle
fuel oil system
lube oil system
salt water service system
fresh water service system
sanitary service system
fuel oil storage and transfer system
reciprocating pumps
high pressure evaporators
steering engines
bearings, shafting
stern tube, tailshaft
fuel oil
lube oil
refrigeration system
fire fighting
watch standing
safety
emergency procedures

centrifugal pumps
rotary pumps
auxiliary exhaust system
steam bleeder points
ship's generators
electrical motors
gland sealing steam system
heat exchangers

Under each heading the following was covered:

nomenclature
construction
operation
maintenance
repair
number
types
applications
characteristics
qualities
system analysis

Because of limited time, and the nature in which the lectures had to be put together, concentration was in the area of fundamentals and basic principles, with the greatest portion of the time spent in the operation of the various systems and pieces of equipment.

I was available to the Cadets eight hours a day when I was on watch, in the classroom for the lectures and at any other time during the day to answer questions. Two major examinations were conducted, copies of which are attached. Also particular written assignments were required and are noted on the Final Grade Reports. The Sea Projects were to be handed in for final grading when Finished With Engines is rung down below at the end of the cruise. In addition to this, each Sophomore Cadet of the Engineering Section was required to undergo an oral examination with me in the Engine Room, consisting of operating procedures learned through the lectures and through experience while on watch.

On the second half of the Cruise, permission was sought and granted by the Chief Engineer of the training ship to have the Cadets of Texas Maritime Academy stand next higher watches till debarkation in Galveston. As the result, Sophomore Engineers stood top Engine Room watches in rotation, and Freshmen stood Sophomore watches. Their performance was deemed exemplary by the Engineering Department, for their experience, knowledge and common sense in light of the fact that Maine Maritime Academy Cadets in similar positions were one full year ahead of them in professional academic work.

The performance of the Cadets in their engineering tasks is recorded on the individual grade reports which are attached.

I want to make mention of a "Well Done" to all hands for the interest they have shown, the manner in which they worked, their cooperation, and a special mention for the entire Sophomore Engineering section which undertook and admirably completed many of the lectures for the Freshmen class, and the oral examination which they conducted for the Freshmen on their own initiative.

13 April 1964

Klaus V. Luehning
Engineering Training
Officer

TEXAS MARITIME ACADEMY
WINTER CRUISE '64
T/V STATE OF MAINE

SEA PROJECT

ENGINEERING CLASS
1966

The following sea project is to be completed by each Cadet individually, and turned in to Lt. Klaus V. Luehning at or before FWE at Galveston on or about 11 April 1964.

The project is to be typed or written in ink, and all drawings are to be done on separate paper. The drawings shall conform to all the conventions of mechanical and electrical drafting. The drawings may be done in a freehand style, however, perspective, relative size, scale, layout, and clearness are to approximate a professional instrument drawing. Drawings may be done in pencil. All lines shall be of a continuous nature. No scratchy drawings will be accepted.

The project will consist of a series of questions and projects to be completed in a manner best suited to the imagination and initiative of the individual Cadet. The question need not be repeated on the answer paper, hoever, question number and answer number should coincide. Spelling, punctuation, clearness of style, will all be considered in the final grade.

BOILERS

1. Make a schematic sketch of the boiler on the T/V State of Maine, showing all lines, valves, and other appurtenances.
2. Make a sketch and describe the operation of the feedwater regulator on the boilers of the T/V State of Maine.
3. In the manner of a list of steps, give the procedure for putting a dead boiler on the line. Conditions:
   a. boiler has been worked on
   b. hydrostatic test has not been completed
   c. there is water in the boiler to height of a full gage glass
   d. the boiler is at ambient temperature
4. Explain the phenomena of swell (or rise) and shrink as pertains to feedwater level of a boiler.
5. Explain the "end-points" of a boiler, and give their right sequence of occurrence in a properly designed boiler.
6. List the steps of the Drew boiler water test.
7. What chemicals are used to treat the boiler water for low phosphate content, alkalinity, oxygen, and provide flocculence to the sludge?
8. Why are soot blowers air cooled when the soot blowers are not in operation?
9. How are soot blower elements fastened in the tube banks?
10. List twelve (12) external boiler mountings on the main steam & water drum.
11. What are the USCG rules and regulations concerning dry pipes for water tube boilers.
12. What is the cause for a low CO_2 content in a stack gas analysis with an apparently clear stack?
13. Describe the water circulation pattern of a "D" type boiler equipped with waterwalls and floors.
14. Explain the "pop" principle of safety valve operation and illustrate with a mathematical problem.
15. Explain the reason for the need of some amount of excess air to be supplied to the furnace of a boiler.
16. Explain the effects of salinity in boiler water.
17. Explain the reason for the difference in drum & superheater safety valve settings.
18. Explain the procedure to be followed to replace a gage glass on a steaming boiler.
19. What type of sensing element is the "heart" of the Bailey motive power for the system?
20. Make a sketch and describe the expansion joint of the main and auxiliary feed piping going through the boiler drum to the internal feed line.
21. How would you recognize the effect of carry-over in a boiler, and what would you do to correct it?

22. Differentiate between priming and carryover.
23. When and how would you recognize the end-point of combustion?
24. How would you fight a fire in the windbox of a boiler not equipped with steam smothering?
25. List all the firefighting equipment in the fireroom of the T/V State of Maine and describe what it is, how it works, and the amounts provided.
26. Describe the insulation and firebrick arrangements for the floor, a waterwall, and a back wall of a "D" type boiler. Specify thicknesses, materials, and construction.

STEERING ENGINE

1. Give a complete description of the steering engine aboard the T/V State of Maine. Make a complete schematic sketch of the engine showing all lines, valves, and pumps and label same. Give a list of the operating procedure for initial starting and changeover in event of failure of one pump.
2. List and explain the requirements for a good telemotor oil.

REFRIGERATION

1. Make a complete schematic diagram of a ship's service refrigeration unit. Explain the purpose and operation of the following:
    - thermal expansion valve
    - solenoid valve
    - back pressure valve
    - suction pressure regulator
    - dehydrator
    - strainer or scale traps
    - compressor
    - low suction pressure cutout
    - high pressure cutout
    - condenser
    - receiver
    - charging connection
    - vents
    - receiver bulls eye
    - water regulating valve

   Explain how one would add oil to a compressor in operation.
   Explain how one would purge a refrigeration system.
   Explain how one would pump down a reefer unit to work on it.
   Explain the use of a Halide torch.

ELECTRICITY

1. Make a schematic wiring diagram of a DC generator.
2. Explain the purpose of the commutator.
3. Explain the purpose of a brush, its composition, its maintenance, its fitting to the commutator surface, and list the reasons for brushes sparking.
4. Explain the construction of a brush holder, and state the function of brush pressure and how one would measure it.
5. Explain the function of the reverse current relay on a generator board.
6. Explain how one would adjust the voltage on a single generator.
7. Explain how one would parallel a generator with one already on the line. Assume the other generator is in operation and idling.
8. Take any DC motor and complete an overhaul procedure for the motor in a program of planned preventive maintenance.
9. How would one resurface a badly scored and off center commutator for a small armature, ready for service.
10. Explain a short, a ground, and an open. Given an example of how each might take place.
11. Explain the use of a megohmmeter.
12. What is the function of a motor controller?
13. What would you check on a motor in operation when making your rounds on watch?
14. Explain the proper procedure for renewing the grease in a motor bearing.
15. Discuss the implications of "Degrees C. rise for continuous operation 40°C." What is ambient temperature?
16. What are the characteristics of:
    series motor
    shunt wound motor
    compound wound motor

GENERAL

1. Explain how you would repack a steam valve in a live steam line, assuming that the system can be secured for this job.
2. Explain the function of a lantern ring and make a sketch of it showing how it works.
3. Make up an overhaul procedure for a low pressure centrifugal pump, listing all the items to be checked.
4. Describe a typical condensate pump.
5. Make a sketch of the stern tube, provide a description of its construction, operation and maintenance.
6. Make a sketch of a line bearing.
7. Describe the operation of a disc type lube oil purifier.

8. What are the essential qualities of a good turbine lube oil?
9. Describe the lube oil system aboard the T/V State of Maine.
10. What lube oil alarms and main engine safety devices are provided aboard the T/V State of Maine?
11. Describe the construction and operation of a deaerating or DC heater.
12. Why are the first and third stage heaters installed in the main feed system? Where do they get their heating steam? Why is not live reduced boiler steam used instead?
13. Make a sketch of and describe the constant pressure steam regulator.
14. How does an excess pressure regulator function? (Sometimes used on main feed pumps.)
15. Make a sketch of the main condenser and label all parts, lines, and valves.
16. Describe the operation of a main air ejector. How would you put it on the line, or start it up?
17. Describe the function of gland sealing steam. Where does it come from? How is it regulated? Where is it used?
18. List as many ways of losing vacuum as you can think of. When at full sea speed or maneuvering why is losing vacuum an emergency condition?
19. Describe the operation of a "D" slide valve on a reciprocating pump. How would you set the valves on a duplex reciprocating pump?
20. What are the advantages of reciprocating pumps over centrifugal pumps? What are the disadvantages?
21. List the procedure for starting and securing a reciprocating pump and a centrifugal pump.
22. How would you put a main feed pump on the line with one already in operation, and how would you secure the other one?
23. What is the function of the gland seal condenser? How is it cooled? Where does the condensate go? Describe the gland exhauster.
24. What type of pumps are used for lube oil, fuel oil, steering engine? Describe each type.
25. Describe the purpose and operation of the following:

    fuel oil storage tanks
    fuel oil transfer pump
    transfer pump suction strainer
    settling tank
    fuel oil service pump suction strainer
    fuel oil service pump
    discharge strainer
    fuel oil heater
    fuel oil meter
    back pressure regulating valve
    VC burner

26. How would you detect water in the fuel oil going to the burner? How would water enter the fuel oil service system? How would you get rid of it?
27. What are the essential qualities of a good fuel oil?
28. Give a complete description of one of the main engines on the T/V State of Maine, its construction and operation, from bulkhead steam stop to shaft. Include a sketch of the main gear arrangement. How is expansion of the engine due to temperature differential compensated for?
29. Make a complete schematic sketch of the high pressure evaporator installed on the T/V State of Maine, and provide a procedure for starting and securing it.
30. Make a complete list of all the fire fighting gear in the engine room and describe its function and operation. Explain on what type of fires each type of system would be used.
31. Make a list of the different types of instruments used to measure pressure, temperature, rate of flow, level, and speed on the T/V State of Maine and describe the operation of each.

Attached please find the Sea Project for the Engineering Class of 1967. It is expected that each Engineering Cadet in the Class of 1966 be able to fully and completely answer the questions in that Sea Project. Two (2) weeks before the end of the Cruise each Engineering Cadet of the Class of 1966 will make an appointment with Lt. Klaus V. Luehning to undergo an oral examination in the subject matter covered in the Sea Projects and the operating techniques learned while on watch. The oral examination will be weighted approximately 30% of the final grade for the Cruise.

TEXAS MARITIME ACADEMY
WINTER CRUISE '64
T/V STATE OF MAINE

* SEA * PROJECT *

ENGINEERING CLASS OF 1967

The following sea project is to be completed individually by each Cadet and turned in to Lt. Klaus V. Luehning before FWE arrival Galveston on or about 11 April 1964. The project is to be completed legibly in ink, typed or written. All accompanying drawings are to be made on separate paper in pencil in a professional manner as dictated by the conventions of mechanical and electrical drafting. The drawings may be done in a freehand style, however, dimensions, perspective, relative size and scale shall be as close as possible to instrument technique. No scratchy drawings will be accepted. Lines shall be of a sharp and continuous nature. Spelling, punctuation, and style of writing will be considered in the final grade. Each Cadet is expected to use all the facilities available to him to complete the project.

The project will consist of a series of questions and projects. Each question is to be answered in detail and as completely as possible. The question need not be rewritten before the answer, however, question number and answer number should coincide. Although the sequence of questions and answers outlined is desirable it is not required.

Each Cadet is reminded that this project will be a valuable source of information if executed with that intent.

BOILERS:

1. What is the purpose of the gage glass?
2. Make a sketch of a gage glass showing its construction.
3. Why are two gage glasses mounted on the boiler drum?
4. What is the purpose of the air vent on the drum?
5. What is the purpose of the feed stop and check valve? Where is it located?
6. Describe the internal feed line of the boiler drum.
7. Describe the function of the dry pipe, and what are the USCG regulations concerning same?
8. What is the function and purpose of the auxiliary feedwater system? Is it identical to the main feed system, and if not, why not?
9. Describe the draft system for the boilers on the T/V State of Maine.
10. What type of fuel oil burners are used on this ship?
11. Describe the process of atomization for these burners.
12. What type of fuel is used aboard this ship? What cleaning and heating requirements are necessary? How often do the burners have to be changed? Why? How are they cleaned?
13. What instruments are available in the fireroom to judge and regulate the performance of the boilers?
14. What automatic equipment is available in the fireroom for the operation of the boilers?
15. What fire fighting equipment is available in the fireroom? What are the USCG regulations concerning fire fighting gear in firerooms?
16. How many safety valves are attached to each boiler? Where are they attached? Why? When do they function?
17. Make a list of all the external mountings and fittings for one boiler.
18. How often are tubes blown? Why? How?
19. Describe the procedure for changing a burner.
20. Sketch the fuel oil piping necessary for one burner from the header and label all parts.
21. Make a schematic sketch of the boiler showing arrangement of drums and tubes, steam lines, valves, desuperheater and superheater.

REFRIGERATION

1. Make a schematic sketch of a simple freon expansion system.
2. What is the purpose of the evaporator, condenser, compressor, expansion valve, dehydrator, scale traps, back pressure regulator, water regulating valve?
3. What type of oil is used for the reefer compressor? What are its properties?

4. Make a list of the automatic controls in a refrigeration system and describe the function of each.
5. What boxes does the ship service reefer unit service and at what temperature is each kept?

ELECTRICITY

1. How many, what type, what rating and what type of prime mover is there, for the ship's generators?
2. Make a list of the meters found on one of the generator's control board, also switches and breakers.
3. Make a list of all the electrical services that the generators provide power for.
4. What is a circuit breaker?
5. What is a fuse? How does it work? Why is it used?
6. What is a megohmmeter? What does it measure?
7. What is a brush? What are they made of? What is the pigtail?
8. What is a commutator?
9. What is a ground? a short? an open?
10. What is a rheostat?
11. How are motors and generators cleaned?
12. What are some causes for sparking at the brushes?
13. What is a battery? How does it work?
14. Describe the batteries for the Emergency Diesel starting system.
15. What is an ampere? volt? watt? kilowatt? ohm?
16. What is Ohm's Law?
17. What is a series circuit? parallel circuit?
18. What would you check when inspecting a motor that is running?

STEERING ENGINE & TELEMOTOR

1. Describe the steering engine on the T/V State of Maine.
2. How is the ram connected to the rudder stock?
3. What type of oil is used for the steering gear? What are its properties?
4. How many steering stations are there? Where are they?
5. What type of pump is used to actuate the ram?
6. Make a sketch of the telemotor in the steering engine room.
7. Describe the operation of the telemotor in the steering engine room
8. Make a sketch of the Rapson slide arrangement.

GENERAL

1. Completely describe the construction of a single stage, low pressure centrifugal pump such as the distiller condensate pump or the fresh water service pump. Make a half section veiw of this pump and label all parts and surfaces.
2. Explain the need for gland sealing water on main and auxiliary condensate pumps. Where does the gland sealing water come from?
3. List the major pumps in the engine room and describe each pump as to its characteristics, such as: centrifugal, horizontal, single stage, low pressure, . . . etc.
4. Describe the action of a "D" slide valve on a reciprocating pump.
5. What are the advantages of reciprocating pumps over centrifugal pumps?
7. List the procedure for starting a reciprocating pump.
8. List the procedure for starting a centrifugal pump.
9. Where are duplex strainers used in the engine room and why?
10. What is an atmospheric drain tank?
11. Where do the drains from the atmospheric drain tank go to at sea? in port?
12. How many lube oil coolers are there? What type? How is leakage of sea water into the lube oil prevented? Sketch the expansion joint of the lube oil cooler shell.
13. Explain the difference between a globe valve and a gate valve. Where, or in what service would you use a globe valve instead of a gate valve?
14. What is the proper way to install valves in piping systems?
15. What is a steam trap? How does it function? Name some different types of steam traps.
16. What is a flexitallic gasket? Where is it used?
17. What is sheet rubber packing? Where is it used?
18. What is the difference between packing and gaskets?
19. What is lagging? What types are there? Where are they used?
20. Where is brass piping used aboard a ship? Why?
21. What is an open end wrench? Make a sketch.
22. What is a combination wrench? Make a sketch.
23. What is a pipe tap? When is it used?
24. What is a pipe die? When is it used?
25. What kind of work is done on a lathe?
16. What type of work is done on a drill press?
27. What are socket wrenches?
28. What is an allen screw? What is an Allen wrench? Make a sketch.
29. What is a micrometer? Where is it used?
30. What is a tool bit? a tool holder? a chuck? a faceplate?
31. What are the safety precautions when using a grinder?
32. What type of lube oil purifier is aboard the T/V State of Maine? What is the principle of operation?

33. What salt water services does the fire & sanitary pump provide? If this pump breaks down what other pump or pumps can be used in its stead?
34. What are the alarms available for the main lube oil system? What other safety and check devices are available?
35. Trace the desuperheated steam and list the reducing valves encountered, what pressures are available and what services do they provide?
36. Make a schematic sketch of the make-up feed evaporator, label all parts and describe its operation.
38. Why is gland sealing steam used on the main engine?
39. Where does the make-up feed come from on the T/V State of Maine? Why is it necessary? How do you judge when it is needed? How do you put it into the main feed system? Where does it enter the main feed system?
40. How many feed heaters are there on the T/V State of Maine? State the sequence in which the feedwater goes through the heaters. How is the feedwater heated? Where does the steam come from? How much hotter is the steam than the water going into the heater? (Use the 3rd stage heater.)
41. What is the purpose of the deaerating heater? Why should the temperature be above 240°F.?
42. Make a schematic sketch of the gear arrangement for one engine. Include the oil lines superimposed to show where and how the gears and their bearings are lubricated.
43. What is a pressure gage? How does it work?
44. What is a thermometer? How does it work?
45. What is a vapor bulb thermometer? How does it work? State an application.
46. What is a pyrometer? How does it work? Where is one located?
27. What is a manometer?
48. What is a pneumercator? How does it work? Where is one located?
49. What are the duties and responsibilities of the
    a. Cadet Engineer
    b. Junior Cadet Engineer
    c. Cadet Fireman/Watertender
    d. Cadet Oiler
    e. Deck Electrician

TEXAS MARITIME ACADEMY

MID CRUISE EXAMINATION

1. Describe and make a neat sketch of a velocity compounded impulse turbine stage, and a pressure compounded stage.
2. Make a sketch of an impulse blade and label all parts.
3. Briefly describe the following and state its purpose:
    a. caulking strip
    b. seal strip
    c. locking piece
    d. labyrinth packing
    e. carbon packing sealing surfaces
    f. turbine wheel
    g. nozzle
    h. diaphragm
    i. steam chest
    j. nozzle control valves
    k. overspeed trip
    l. speed limiting governor
    m. casing relief valve
    n. crossover trunk
    o. quill shaft
    p. turbine thrust bearing
    q. axial clearance indicator
    r. shrouding
    s. banding wire
    t. garter spring
4. Make a neat sketch of a double reduction articulated gear set showing and labeling all parts.
5. Explain the reason for using double cut helical gears, and illustrate with a sketch.
6. List and explain the properties and characteristics of a good turbine lube oil.
7. Explain the boundary theory of lubrication.
8. Describe a Kingsbury type main thrust bearing.
9. Describe the construction and operation of a line shaft and its bearings.
10.
    a. Make a sketch of an air ejector condenser complete with one set of nozzles, showing all lines and valves, and label same. Draw a self-sealing type of loop seal with the above sketch.
    b. Describe the probable causes for:
        1) steam blowing from the vent
        2) rapidly dropping vacuum and then a gradual rise
        3) flooding of the after condenser

11. Give the function of the following in a generator:

a. commutator
b. field pole
c. mica
d. brush
e. armature
f. field rheostat
g. circuit breaker
h. disconnect switch
i. brush arm
j. risers

12. List the steps necessary to start a turbo-generator and prepare it ready for paralleling.

MAKE NEAT SKETCHES - KEEPING WRITING LEGIBLE - ANSWER THE QUESTION

MAXIMUM TIME ALLOWANCE --- 3 HOURS

TEXAS MARITIME ACADEMY

Cruise Exam #2

1. Sketch the arrangement for connecting the rudder stock to the main drive on steering gear of the Liberty ship type.
2. Explain and sketch the operation of the telemotor sender.
3. Explain the purpose of the follow-up arrangement of the electro-hydraulic steering gear.
4. How would you lock the rudder in position other than using the band brake on the steering engine on the T/V State of Maine?
5. Explain the function of the Rapson slide. Sketch and label same.
6. Give the step by step procedure for raising the vacuum on the main engine, starting each piece of equipment individually with a list of steps, and prepare the engine ready for maneuvering.
7. State the function of the following briefly:
   - suction pressure cutout switch
   - discharge pressure cutout switch
   - back pressure regulator
   - compressor relief valve
   - thermo-expansion valve
   - solenoid valve
   - receiver
   - scale trap
   - dehydrator
   - water regulating valve
8. Make a schematic sketch of a make-up feed evaporator showing all lines and valves and regulating equipment, and label same completely.
9. In general terms, what are the duties and responsibilities of the Engineer of the Watch?
10. Identify the following:
    - "D" slide valve
    - valve stem
    - crosshead
    - Kinghorn valve
    - plunger rod
    - steam chest
    - valve chest
    - wearing ring
    - impeller
    - double suction impeller
    - multi-stage pump
    - volute
11. What would you do if:
    - at sea and proceeding full ahead on 10 nozzles
    - evaporator on the line to the aux. exhaust
    - two main generators on the line and paralleled
    - two lighting generators on the line
    - fire and sanitary pump both on water service system
    - inboard main feed pump on the line, recirculating valve closed

inclement weather with a choppy sea
in dangerous navigable waters
and
both induced draft blowers are stopped because of a fire and are inoperable.

12. Explain the construction of the stern tube.

TEXAS MARITIME ACADEMY

Freshman Examination #1

1. Name two types of turbine packing.
2. a. Name two types of turbine blading.
   b. Where would each type of blading be found in a cross-compounded main turbine unit?
3. Where would you find the astern turbine?
4. Describe and sketch three types of root fastenings.
5. What is the purpose of the astern guardian valve?
6. Describe the flow of steam from the ahead throttle to the main condenser through the main engine on the T/V State of Maine.
7. How is the high efficient RPM of the turbine reduced to the low efficient RPM of the shaft? Explain.
8. Make a schematic sketch of the main steam cycle on the T/V State of Maine, and label all parts--NEATLY.
9. List all the major elements in the main L.O. system.
10. What equipment is supplied with salt water from the salt water service system? 1.__________ 2.__________ 3.____________ 4.___________
11. Describe, in detail, the procedure for changing a burner in the boilers on the T/V State of Maine. Include all safety procedures.
12. List the main elements of the main fuel oil system.
13. What are the duties of the oiler? Of the fireman?

TEXAS MARITIME ACADEMY

Freshman Examination #2

1. Describe the steering engine on the T/V State of Maine, including descriptions of the ram, the radial piston pumps, and the follow-up control.
2. Fill in the normal at sea readings as found on the T/V State of Maine:
   - main steam pressure
   - superheat temperature
   - f.o. service pump disch. press.
   - salt water service pump disch. press.
   - f.w. pump disch. press.
   - l.o. service pump disch. press.
   - l.o. press. to the gears
   - air ejector steam pressure
   - main generator volts
   - lighting generator volts
   - HP engine horsepower
   - main condensate pump disch. press.
   - main feed pump disch. press
   - AC generator volts
3. What are the duties and responsibilities of the Oiler on watch?
4. Make a simple schematic diagram of a Freon 12 refrigeration system and explain its operation.
5. Make a sktech of a boiler gage glass and label all parts.
6. List the steps necessary to start and secure the steam bilge pump on the T/V State of Maine.
7. Make a neat sketch of the Rapson slide arrangement and label all parts.
8. Make a list of all the fire fighting equipment found in the fire-room and describe its use.
9. Describe the procedure for blowing tubes.

A P P E N D I X B

1965 CRUISE OFFICER-FACULTY GUIDE

TEXAS MARITIME ACADEMY

TRAINING SHIP TEXAS CLIPPER

DEPARTMENT OF MARINE ENGINEERING

OFFICER - FACULTY GUIDE

SUMMER CRUISE TRAINING PROGRAM

BY

KLAUS V. LUEHNING

PROPERTY OF

____

TEXAS A&M UNIVERSITY

COLLEGE STATION, TEXAS

15 MAY 1965

P R E F A C E

The academic program of Texas Maritime Academy includes three summer training cruises conducted aboard ship while the vessel is en route to various ports around the world. The purpose of the cruise is to give each Cadet the opportunity to exercise the knowledge he has acquired in the classroom, to expand that knowledge, and to acquire the attitudes, abilities and qualities of a ship's officer. To accomplish this task a training program was devised and is contained in this volume.

The training program is composed of the execution of various tasks, the completion of which will render the student competent in the required professional abilities of his major area of study. The training program was devised and organized with the objective of using the training ship to its maximum as a training device.

The training program presented herein is the first training program of Texas Maritime Academy and will be used for the first cruise that the student body and faculty will make on their own training ship. The first two cruises the Academy has made since its founding were made as guests of two other state maritime academies, sailing aboard their ships, and participating in their training programs. This program was formulated on the assumption that better use could be made of the ship and the cruise if the training program was designed to that end.

The student body of the Academy is split into two groups according to their major area of study, either Marine Transportation or Marine Engineering. For the cruise, each group is divided into six sections, and each section is composed of a number of students from each of the three classes participating, that is, a number of seniors, juniors, and sophomores. Each section remains intact during the cruise and as a unit is rotated through six different job categories, gaining experience in each category by performing the tasks required to keep a ship efficient and performing properly. For example, the six engineering sections rotate through the following job categories:

1. 8 - 12 watch
2. 12 - 4 watch
3. 4 - 8 watch
4. maintenance section
5. machinist section
6. electrical section

While the student is performing these tasks, during a time of day so designated, each Cadet in each group will participate in a lecture on some professional subject. These lectures are given only while the ship is at sea. Also, each Cadet is given a series of written assignments to complete, which is termed the Sea Project. In total, the training program attempts to attain its objective by the following method:

1. Expose each Cadet to as many facets of the professional

knowledge to be gained as possible by having him actually perform the tasks required under the supervision of professional faculty members. This is accomplished by allowing each Cadet to think and act out each task and by rotating him to the various tasks at specified intervals.

2. Expose each Cadet to a series of lectures dealing with the professional work he is engaged in. These lectures are designed to impart to the student knowledge of a general nature, such that he becomes familiar with the various methods of operation, types of equipment, and procedures used. The lectures attempt to broaden the knowledge of the student so that he becomes familiar with other ships and not just the training ship.

3. The written assignments were designed to act as a collator of the voluminous amount of information that is required by each Cadet for study, to take the federal license examination for a merchant marine officer.

At the end of the cruise, each Cadet will have performed tasks in the complete range of activity of his major area of study commensurate with his academic progress up to that time. He will have participated in approximately thirty six lectures in subject matter of a general nature pertaining to his major area of study, and will have completed a notebook of written assignments. During the third and last cruise, each Cadet will be required to demonstrate to the faculty his ability to assume the duties and responsibilities of either a third mate or a third assistant engineer.

This Officer-Faculty Guide is divided into three sections. Section One contains general instructions and the training program organization. Section Two contains the Sea Projects. Section Three contains supplementary information. The organization and instructions contained in each section were written to be directed to the Cadet involved. Each Cadet will have a copy of the organization of his department, the job descriptions, the lecture title sheets, the Sea Project, and the supplementary information as provided. All this material combined in a somewhat different manner has been titled a "Cruise Book." It is the intention of the Training Officer that by providing each Cadet with a copy of all instructions necessary, less confusion will result in the conduct of the cruise.

The Officer-Faculty Guide differs from the Cadet's "Cruise Book" only in the manner of collation and the inclusion of lecture outlines and instructions for the instructors.

A C K N O W L E D G E M E N T

The author wishes to acknowledge here all of the people who have contributed toward the completion of this volume. The program was written in partial fulfillment of the requirements for a master's degree in the Department of Industrial Education in the Graduate College of Texas A&M University. The author was fortunate enough to be associated with the Academy since its first cruise and has received permission to put this program into effect for the premiere cruise of the Academy in the summer of 1965. The program in this volume follows a pattern and an emphasis which the author felt was needed and does not exist for those aspiring for careers in the maritime field, especially now in an age where education for the future is even more important than in the past. Special thanks go to the Superintendent of the Academy, Captain Bennett M. Dodson U.S.N. (ret.), who accepted my original proposals and is allowing me the chance to put a new program into effect in a new school.

Thanks go to James Hopkins, Assistant Professor of Marine Transportation who undertook to re-write the Engineering Department program to suit the needs of the Deck Department. The following faculty and staff of the Academy helped by giving of their time, patience, help and advice for the last year and a half:

Cdr. Frank W. Smith,
Associate Professor of Marine Transportation

Cdr. Francis Tormollan
Associate Professor of Marine Engineering

Lt. Ralph A. Dahm
Associate Professor of Marine Engineering

Lt. Dennis P. Cannon
Instructor in Marine Transportation and Enrollment Officer

Lt. David C. Mercer
Assistant Professor of Marine Engineering

Mr. James H. Allen
Head Accountant

Mr. Charles G. Shook
Assistant Accountant

Mrs. Nancy Leach
Senior Secretary

Mrs. Dee Bonorden
Typist

Mrs. Pamela Ryan
Typist

Also, thanks go to the following for contributing their opinions, suggestions and ideas:

Captain Lauren S. McCready, U.S.M.S.
Head, Dept. of Marine Engineering
U. S. Merchant Marine Academy

Dr. Chris H. Groneman
Head, Dept. of Industrial Education
Texas A&M University

Dr. Everett R. Glazener
Professor of Industrial Education
Texas A&M University

Dr. Leslie V. Hawkins
Professor of Industrial Education
Texas A&M University

Special thanks go to the first class of Texas Maritime Academy and all those who have followed in "putting up" with my prodding and who will be the products of this work. And last, immeasurable thanks to my wife, Barbara, who has had to live with me while I courted the mistress of the sea and begot a program in her honor.

College Station, Texas

15 May 1965

Klaus V. Luehning
First Assistant Engineer
T/S Texas Clipper
Engineering Training Officer
Texas Maritime Academy

TABLE OF CONTENTS

		PAGE NO.
PREFACE		i
ACKNOWLEDGEMENT		vi
MARINE ENGINEERING TRAINING PROGRAM - SECTION ONE		
Part 1	Letter of Promulgation	1-1
Part 2	Instructions	2-1
Part 3	Marine Engineering Safety Program	3-1
Part 4	Cruise Book Introductions	4-1
	TMA/4E	4-2
	TMA/3E	4-3
	TMA/2E	4-7
Part 5	Training Program Organization	5-1
	At Sea Schedule	5-21
	In Port Schedule	5-26
Part 6	Cadet Job Descriptions	6-1
Part 7	Senior Class Lectures	7-1
Part 8	Junior Class Lectures	8-1
Part 9	Sophomore Class Lectures	9-1
MARINE ENGINEERING TRAINING PROGRAM - SECTION TWO		
Part 10	Sea Project Instructions	10-1
	Written Work	10-3
	Drawings	10-6
Part 11	Senior Class Sea Project	11-1
Part 12	Junior Class Sea Project	12-1
Part 13	Sophomore Class Sea Project	13-1

MARINE ENGINEERING TRAINING PROGRAM - SECTION THREE

Part 14	General Watch Procedure	14-1
Part 15	Specific Watch Procedure	15-1
Part 16	Maintenance Pointers	16-1
Part 17	Grades and Grading	17-1

MARINE ENGINEERING TRAINING PROGRAM

SECTION ONE

TEXAS A&M UNIVERSITY
TEXAS MARITIME ACADEMY
GALVESTON, TEXAS

May 15, 1965

TO: Student Body, Department of Marine Engineering

FROM: Klaus V. Luehning, Engineering Training Officer

SUBJECT: Cruise Book - Summer Training Cruise 1965, Promulgation of

1. The Department of Marine Engineering Cruise Book - Summer Training Cruise 1965 of the Texas Maritime Academy Training Ship TEXAS CLIPPER is hereby promulgated for the information and guidance of all personnel attached to or embarked in this vessel. Compliance with its contents will be required of all hands.

2. It is directed that all officers and cadets familiarize themselves with the entire contents and that each cadet complete the required work applicable to his class at the times designated by the Engineering Training Officer.

3. When error in context, conflicting assignments, conflicting watches, or lack of essential instructions are noted, it is directed that the Chief Engineer and/or the Engineering Training Officer be immediately informed so that corrective action can be taken and notations made for future use.

4. Any suggestions for revision, alternations, inclusions or exclusions about the Training Program should be submitted in writing to the Engineering Training Officer for development of the next program.

Klaus V. Luehning

- -

APPROVAL:

TO: Student Body, Department of Marine Engineering

FROM: Captain Bennett M. Dodson, Superintendent

SUBJECT: Cruise Book - Summer Training Cruise 1965, Promulgation of

1. Approved.

Bennett M. Dodson

INSTRUCTIONS

These instructions apply to those directly involved in the marine engineering training program and pertain to schedules, lectures, grading, supervision and overall administration of the program.

The training program for the engineering students of Texas Maritime Academy consists of the following:

a. on watch experience

b. day work experience

c. lectures at sea

d. written assignments

Each Cadet will work approximately eight hours a day, attend a lecture for two hours and have the remainder of the day for study, eating, sleeping and recreation.

The Engineering Department aboard the training ship has been divided into six job categories, and the staff and student body have been divided up to fit the needs of these categories. These job categories are the following:

a. 8 - 12 watch

b. 12 - 4 watch

c. 4 - 8 watch

d. maintenance section

e. electrical section

f. machinist section

Each Cadet will have experience in each job category by being rotated through them. The rotation of the student body will occur after every three days spent at sea. The staff members will maintain their original positions throughout the cruise.

Each officer in the Engineering Department will be required to fulfill his duties and responsibilities within the job category for which he was selected. Direct supervision and authority is under control of the Chief Engineer. In addition, each officer will participate in the training program as an instructor by sharing in the lectures to be given at sea and in the instruction of the Cadets on watch and/or on day work. Direct supervision and authority concerning the training program is under the control of the Engineering Training Officer.

The lectures which are to be given during the cruise have been selected, outlined and scheduled to best fit the needs of the students. The subjects were chosen for their applicability to the student in relation to his academic progress and previous cruise experience. The lectures were given an objective and for the Seniors only, selected references were indicated.

The lectures were outlined for the Seniors and Juniors to guide the instructor through the material. The outlines are comprehensive and are meant for suggestion only. The instructor may deal with the material as he chooses providing, however, that these guidelines are observed:

1. that the scope and indicated depth of material be covered

commensurate with the time allotted,

2. that the student be given every opportunity to satisfy his doubts about the specific material to be covered.

The lectures for the Sophomores were not outlined intentionally. Because of the nature of the sophomore class, differing in course work and experience, it was felt that a lecture topic would be sufficient. The instructor is given every latitude to seek out the level of knowledge of the students and to cover the subject as would best fit the comprehension of the students involved. This is possible because of the organizational structure of the training program and the lecture schedules. Since most of the officers will be engaged in lectures, and because of the ship's routine, each instructor will be able to give instruction to classes no larger than four to five in number so that individual attention may be possible. Specific material for the Sohpomore lectures may be gleaned from the Senior and Junior lecture outlines, the written assignments and reference materials.

In giving the lectures, the instructors are urged to use the facilities aboard ship for demonstration, practise, or testing. There are no specific recommendations as to where or how the lectures be given, provided that discipline and an academic learning atmosphere be preserved. Instructors are encouraged to hold their classes at the sight of the equipment if applicable.

The Cadets have been furnished the title sheet for each lecture to use for reference in preparation for the lecture and for noting the reference material pertaining to the subject matter. Also, they will be requested to comment on the face of the sheet what areas of instruction they feel they need more time with than was allotted. The instructors are requested to comment on the lectures also, for guidance in preparing the next training program. Helpful items for developing the next program could be:

1. Was there too much, enough, or too little information in the outline for the time available?
2. How was the lecture received by the students?
3. Was the information a duplication of what they already knew?
4. Was the material too difficult to cover with the facilities at hand?
5. Did the students lose interest easily, were they tired, did they become bored?
6. Did the students show any improvement in their knowledge and abilities on watch and day work following the lecture?

At the end of every watch and work day each Cadet will be graded. Prepared forms for entering the name of the Cadet and the grade will be provided. The Watch Grade Report should be filled in by the Cadet Engineer, listing all Cadets on watch. The Cadet Engineer should enter the grades for the Juniors and Sophomores based on his evaluation of the performance of each Cadet according to the job descriptions and the general and specific watch procedures. The Officer on watch will then enter a grade for the Cadet Engineer based on his performance on watch, the job description, the general and specific watch procedures, and his ability to correctly evaluate the performance of his crew. The Day Work Grade Report will be completed in like manner. Both reports should be turned in to the Engineering Training Officer immediately after the completion of a watch or work day.

Grades for the Watch Grade Report, the Day Work Grade Report and the written assignments will be entered according to the following grading scale:

VG - very good

G - good

S - satisfactory

U - unsatisfactory

The grades will be averaged at the end of the cruise and a final grade computed based on the following weight scale:

Watch grade	25%
Day grade	25%
Sea Project	40%
Tests	10%
	100%

Final grades will be enteres as A, B, C, D or F for the entire cruise. The grade of D will be assigned to a student only after a review of his work has been made by the entire Engineering Department.

The grading system chosen for the cruise was based on the criteria of:

a. ease of grading

b. ease of evaluation

c. limited staff and time for record keeping

d. the nature of the activities involved

The sea project assignments will be completed on the Cadet's own time using the ship, the officers, the ship's library and his own textbooks as resource materials. The assignments will be turned in weekly and graded by the Engineering Training Officer with the help of other officers in the Engineering Department.

This is the first training program of Texas Maritime Academy and although much effort was expended to make this the best program, changes are inevitable. The Engineering Training Officer and the Engineering Department welcome constructive criticism from faculty, officers, staff and students.

Any questions about the training program should be referred to the Engineering Training Officer. Any problems, conflicts, or misunderstandings about the program should also be referred to him as soon as possible for rectification, and for notes to be used in revising the training program.

PART 3

MARINE ENGINEERING SAFETY PROGRAM

M A R I N E E N G I N E E R I N G S A F E T Y P R O G R A M

INTRODUCTION

The safety program presented in the following pages is one which is part of the whole training program of the engineering students of Texas Maritime Academy during the summer cruises. The entire program is formulated to be an integrated program whose objective is the optimum use of the training ship as a training device. In line with this objective, the safety program will also attempt to maximuze the use of actual situations to bring about a successful transfer of knowledge from the instructors to the students.

THE SAFETY PROGRAM

The formal instruction in safety will be accomplished through the medium of classroom lectures on campus during the academic year, through lectures aboard ship and through written assignments during the cruise. Informal instruction will occur throughout the entire cruise while each cadet is engaged in his regular ship's work. Special opportunities for instruction and drill will occur during drills conducted at announced and unannounced times to be decided on the cruise.

The classroom lectures in safety are carried out when particular situations call for the introduction of safety materials, procedures, methods or skills. At sea, while the student is participating in the regular routine of the training ship there will be numerous drills.

Advantage will be taken during these drills to demonstrate and operate all of the various devices and equipment installed for the safety of the ship and its crew. The written assignments call for certain procedures and facts relating to safety which the student will have for reference in the future. The indoctrination lectures which follow were designed with the objective of providing a personal consciousness in the value of being physically and mentally fit and as a means of exploring and exposing the dangers that are present in an Engine Room. The lectures are made intentionally general and non-specific to provide the greatest latitude in their presentation to audiences of mixed and varied experience and knowledge levels. Also, these indoctrination lectures were designed to act as a bridgework between the classroom and the ship, especially for those making their first cruise.

In summary, each Cadet in the program will participate in three cruises, during which time he will be required to master the professional engineering work, gain confidence in his abilities, acquire the attitudes and qualities of an Officer, and gain the knowledge and insight that safe operation and conduct are the prerequisites for a successful voyage. To this end, each Cadet:

1. receives instruction in the classroom in safe procedures
2. receives indoctrination lectures before departure to set the stage for further examination of safety hazards
3. attends lectures at sea on professional subjects where safety is stressed

4. participates in drills where he will be assigned responsible stations dealing with safety
5. completes written assignments dealing with safety.

INSTRUCTOR'S GUIDE

Topic: Safety - Part I

Lecture Outline

1. The importance of the well-being of the human body.

   The human body in stress may result in:

   a. personal discomfort

   b. personal loss of part of the body

   c. anxiety by close friends and relations

   d. loss of time on the job

   e. loss of time to study

   f. expensive medical bills

   g. expensive facilities must be provided in anticipation of human needs

   h. increased cost of medical supplies and personnel

   i. complications of disease

   j. personal attention by others who must leave their duties

   k. disruption of normal routine by a department, ship or company fleet.

2. How does the human body become distressed physically?

   a. burns

   b. abrasion

   c. cuts

   d. fractures

e. falls

f. dismemberment

g. exposure

3. How does the human body become distressed mentally?

a. fear

b. anxiety

c. frustration

d. despondency

e. hate

4. How can we prevent accidents aboard ship and maintain sound human bodies?

a. creation of interest in the well being of our bodies

b. maintaining that interest

c. locating and exposing the causes of accidents

d. correcting the causes of accidents

5. Are accidents caused by machines or by people?

a. accidents are caused by people

b. machines cannot cause accidents unless improperly used

6. Are all people the same? Is there such a thing as a normal person? How do we differ?

a. all people are not the same either physically or mentally

b. there is no defined and rigid idea of a normal person

c. people differ essentially according to their

1) attitudes

2) abilities

3) knowledge

4) physical makeup

7. People do differ and they exist to serve many purposes, and the well being of their bodies both physically and mentally will help them to contribute to the world by serving either

a. humanity

b. industry

c. country

8. We can provide an atmosphere of safety by a plan which will will tell us how, why, when and where accidents are caused, how to correct the cause and treat the injury.

a. the organization

1) we will use the ship's organization

2) responsibility for safety is everyone's but overall responsibility rests with the Master

Master

Department Heads

Officers

the individual

b. we need to know the facts

1) surveys

2) inspections

3) observations

4) review of records

5) inquiry

6) judgment

7) investigation

c. we need to analyze the causes of the accidents

1) frequency

2) severity

3) location

4) occupation

5) accident types

6) direct causes

7) indirect causes

8) operations

9) tools and equipment

10) obstacles

d. we have to select a remedy for the cause

1) personal adjustment

2) placement

3) instruction

4) persuasion and appeal

5) engineering revision

6) discipline

e. we have to apply the remedy

1) supervision

2) education

3) engineering

9. Film:

Safety on the Job - At Sea
MN-8639
16 mim 1957
Film Library
Eighth Naval District
U. S. Naval Station
New Orleans 40, La.

Shows organization for shipboard safety and emphasizes the importance of crew safety consciousness.

10. Discussion and questions

11. Class Dismissed

Summary:

lecture time	60 minutes
film time	16 minutes
discussion	15 minutes
total time	91 minutes

Training aids: chalkboard, film

Topic: Safety - Part II

Lecture Outline

1. Review lecture Safety - Part I

   a. desire for a healthy body physically and mentally

   b. greatest variable in accident causes is the person involved

   c. by organizing a fact finding, analyzing and remedy application team we can attempt a reduction in causes

   d. the remedies are applied and causes guarded against by supervision of those in authority, by education such as these lectures, and by engineering revisions such as may be performed on this cruise.

2. What things or items in the Engine Room of a ship can make it dangerous for you?

   a. combustible liquids

      1) fuel oil

      2) kerosene

      3) diesel oil

      4) lubricating oil

      5) fine machine oil

   b. presence of fire in the boiler up to 3000° f.

   c. presence of high temperature high pressure steam

      1) 450# 750°F.

      2) 180# 375°F.

3) 35# 265°F.

d. presence of rotating machinery

1) pumps

2) main engine

3) generators

4) shaft

e. dangerous chemicals

1) sulphuric acid

2) silver nitrate

3) sodium hydroxide

4) disodium-orthophosphate

5) muriatic acid

6) hydrazine

7) nitric acid

8) combustion catalysts

f. presence of electrical equipment

1) open type D.C. ship's generators
240 volts
1500 amperes

2) open type electrical generator control board

g. slippery steel plate floorplates

h. steep ladders from one deck to another

i. uninsulated high temperature lines carrying steam, condensate drains, oil, air

j. projections of equipment into aisles and walkways

k. rolling of the ship and inaccessibility of suitable hand holds

l. heavy and cumbersome tools

3. How can you avoid accidents in an Engine Room now that we know some of the hazards?

a. learn what each piece of equipment does

b. learn how each piece of equipment performs its function

c. learn how and why faulty operation can occur

d. make sure you are supervised by a person in authority if you are not an expert

4. How do we come to realize a dangerous situation exists?

a. through the senses

1) hearing

2) seeing

3) smelling

4) touching

5) tasting

5. The uses of the senses is very important to the engineer and crew because

a. the engine room is fairly large

b. the engine room is very noisy

c. the atmosphere in the engine room is hot, very humid, oily and sometimes salty

6. Through the use of his senses the engineer can become aware of many different situations and they can tell him
   a. what is going on
   b. what is wrong
   c. what conditions are changing
   d. where certain people are
   e. what they are doing
7. There are certain basic safety practices which have evolved over the years out of experience and are as valid today as they were years ago. These practices are almost universal aboard ship and they will be in effect on this ship. They evolved for the safety of yourself as well as your shipmates.
   a. Have a purpose before you go into the Engine Room
      1) are you going on watch
      2) are you delivering a message
      3) do you intend to trace lines or study a piece of equipment
      4) do you have a question, a good one
      5) is there trouble that you know of or suspect
   b. Never run in an Engine Room, under any circumstances
      1) floor plates can be slippery, even those that are claimed to be slip-proof
      2) if hand rails are available, use them all the time, even if the ship is steady

3) watch for oil and water spills

4) watch for tools, lines, and pieces of equipment

5) watch for rags

6) watch for floor plates that have been removed

7) watch for projections

8) do not grab for machinery, or lines or pipes to steady yourself, use available hand rails

c. Never whistle in an Engine Room.

1) the whistling sound resembles the sounds that are made by turbines and some pumps

2) the sounds of the Engine Room tell the engineer the running condition of the equipment

3) whistling confuses people and they will suspect trouble

4) whistling resembles the sound made by some steam leaks and is cause for extreme caution

d. Never yell in an Engine Room.

1) it is very disturbing to some people

2) it may be confused with noises of operation

3) it presupposes a dangerous condition

4) it may cause panic

5) it may bring unwarranted help and cause a dangerous condition by people leaving their duties to investigate

e. Immediately after you are in the Engine Room notify the Senior Engineer on Watch or a designated assistant that you are here and tell him your purpose.

1) in cases of emergency the Engineer can take your presence into consideration

2) if no one knows you are in the Engine Room you may be left behind in a dangerous situation

f. Do not throw anything in the Engine Room.

8. Other safety measures:

a. Do not wear any rings in the Engine Room.

b. Do not wear a watch unless absolutely necessary.

c. Do not drop rags, tools, or other debris into the bilges

d. Do not attract another's attention by touching him rather go into his line of vision to attract attention

e. Do not wear any ties in the Engine Room

f. When working around hot lines, pumps, boilers or turbo-generators keep sleeves rolled down and buttoned

g. Notify the Engineer of any feelings of dizziness or sickness

h. If you are not sure what you are about to do, STOP, ask questions, know exactly what you are going to do before you start anything

9. Discussion and questions

10. Class dismissed

Summary:

lecture time	75 minutes
discussion	15 minutes
total time	90 minutes

Training Aids: chalkboard

Topic: Safety - Part III

Lecture Outline

1. Review lecture Safety - Part II

   a. the Engine Room can be a dangerous place for those who are not informed

   b. the Engineer uses his senses as indicators to him of the existence of dangerous situations

   c. there are certain basic safety measures which are always adhered to

      1) have a purpose before going into the Engine Room

      2) never run, whistle, yell

      3) notify the Engineer you are in the Engine Room

2. What are the four most serious situations a ship and its crew can encounter on the high seas?

   a. collision

   b. grounding

   c. man overboard

   d. fire

3. How can we prevent each of these situations?

   a. collision

      1) skillful navigation

      2) knowledge of the International Rules of the Road

      3) judicious use of ship's speed

4) cooperative effort against collisions occurring by:

   a) departments aboard ship
   b) between nations
   c) regulatory bodies
   d) local, national and international law enforcement agencies

b. grounding

   1) skillful navigation

   2) up to date charts, nautical almanacs, navigational equipment

   3) judicious use of ship's speed

   4) cooperative effort between departments aboard ship

c. man overboard

   1) safe handling of all deck machinery

   2) knowledge and respect for a ship's movements through disturbed water

   3) proper maintenance and repair of all equipment and fixtures on deck, such as railings, chains, hatches, side ports, etc.

   4) careful analysis of all situations involving the possibility and all preventive measures carefully executed.

d. fire

   1) Possibly the most serious and most frequent situation aboard ship which involves serious consequences of all aboard plus costly damage to the ship and its

cargo is fire.

2) Both collisions and groundings, although by themselves serious, can be handled with relative calmness and decisive action. What complicates an orderly evacuation of the ship or release is the presence of fire at the same time.

3) fire occurs whenever three agents are mutually present:

   a) oxygen
   b) a combustible material
   c) temperature equal to the kindling temperature of the material

4) by removing either one of the required agents we can stop the combustion process

5) there are four types of fires which are classified by the Underwriter's Laboratories

   a) Class A fires embrace ordinary combustible materials, such as clothing, canvas, cordage, paper, rubbish, wood, etc.
   b) Class B fires include flammable liquids such as gasoline, grease, oil, paint, turpentine, et al.
   c) Class C fires constitute those fires which occur in electrical equipment
   d) Class D fires include automobiles, omnibuses, and commercial trucks

6) fires can be fought by excluding the oxygen from the fire, by removing the combustible material, or by cooling the material and the surrounding area

7) aboard this ship and others the fire fighting equipment available is:

   a) hand extinguishers spaced intermittently throughout the ship
   b) salt water fire system with outlets spaced throughout the ship so that any place on the ship can be reached by a 50 foot hose
   c) fixed CO_2 system for use in flooding important compartments such as holds and the Engine Room
   d) semi-portable CO_2 systems for areas where larger fires may occur
   e) sprinkler system in holds, compartments and cabins
   f) steam smothering systems in oil tanks

8) What do you do when you locate or suspect a fire?

   a) immediately send for help no matter how small the fire is
   b) your first objective is to prevent the fire from spreading; contain the fire in the smallest possible area
   c) use a proper hand extinguisher on the fire once you have definitely determined what it is that is burning
   d) cooperate with the help when it arrives to put out the fire as quickly as possible subject to conditions

9) You will learn and will be required to know the types of fires that can occur, the fire extinguishing systems available, and the U. S. Coast Guard Rules and Regulations concerning fire prevention. You should have or receive each of the following:

   CG - 256 Rules and Regulations for Passenger Vessels

   CG - 257 Rules and Regulations for Cargo and Miscellaneous Vessels

   CG - 123 Rules and Regulations for Tank Vessels

CG - 115 Marine and Engineering Regulations and Material Specifications

CG - 259 Electrical Engineering Regulations

CG - 175 Manual for Lifeboatmen, Able Seamen, and Qualified Members of Engine Department

Cruise Book

4. There will be no formal lecture instruction in fire fighting or other safety measures. As you work on watch and on day work you will be instructed in the use of the various devices, equipment and tools of your profession. As you learn to use them the Officers and Faculty will point out the safety precautions.

There will be regular drills at announced and unannounced intervals which will be used to demonstrate and operate the various devices aboard ship which are installed for safety purposes.

You have already been assigned to:

Fire Stations

Boat Stations

Emergency Squads and

Sea Details

Your assignment is to keep in mind that your well being is dependent upon your

knowledge

ability and

attitude

and all three will be a crucial factor in determining the relative safety in which you and I will sail the seas.

5. Discussion and questions
6. Class dismissed

PART 4

CRUISE BOOK INTRODUCTIONS

TMA-2E	SOPHOMORES
TMA-3E	JUNIORS
TMA-4E	SENIORS

INTRODUCTION

The following pages will contain most of the information that you will need to successfully complete the Cruise with the exception of one very vital ingredient: your earnest desire to cooperate and to work hard. If you apply yourself, what may seem to be an awful amount of work is in reality proportioned, allowing you to establish a routine whereby the work will get done, with time to spare.

The purpose of this, your first Cruise, is to acquaint you with all the machinery and systems aboard this training ship. Once you have acquired an intimate understanding of where the systems are, what they do and how they fit into the overall operation of the plant, you will be able to resume your more theoretical work ashore with an understanding and hopefully an appreciation for the application of physical laws and principles. Then on your second Cruise, you will come to develop your operating skills further and "dig around" much deeper into the equipment that you must come to recognize and operate now.

This Cruise Book contains three sections. The first section explains the organization of the ship and the procedures to be followed by the ship's personnel and should be studied carefully. Before you board the vessel you will be given an assignment from which you should be able to determine where you belong and what routines to follow. Any questions on organization and procedure can be answered by your Section Leader, and should be referred to him.

The second section of the Cruise Book contains your Sea Project. The Sea Project is a type of correspondence course which you will complete before the end of the Cruise, and turn in periodically to the Engineering Training Officer. The Sea Project is a self study project which you will have to complete on your own time at sea or in port or both. It does not fit into the ship's routine nor the Lecture Schedule. However, the entire ship and all its personnel are available to you for seeking out information. The training ship is your own laboratory and you are urged to use it to full advantage. Instructions for completing the Sea Project are given in that section in the first few pages.

The third section of the Cruise Book contains supplementary information which you might find useful in completing the Sea Project, attending your daily routine or during the Lecture periods.

To make this Cruise a pleasant trip as well as a rewarding educational experience you are urged to maintain a sense of good humor, be careful and considerate, show effort and initiative, and again, you are urged to take full advantage of the ship, the Officer-Instructors, and your upperclassmen in seeking out information.

You are now directed to the first sections of this Cruise Book to carefully read the organization and procedures which will govern this Cruise.

INTRODUCTION

This second Cruise will be a demanding one for you, in that, you will have to recall all that you learned on the first Cruise, and in addition, teach your underclassmen each job and operation that you performed. The purpose of this Cruise is to prepare you, so that by the end of the Cruise you will have acquired the knowledge and facility to take on the full responsibility of a Watch or a Day Work assignment.

Your duties on this Cruise approximate those of a technician, where you will have the duties of a Junior Engineer, an Oiler, Maintenance and Repair man, and of a Supervisor. Your responsibilities will be increased many times from your first Cruise, and common sense, tact, clear thinking and professional workmanship will be your guidelines.

The Cruise Book is divided into three sections. The first section contains the organization of the ship and its personnel structure. You are directed to make yourself completely conversant with the material so that you will know where you belong and be able to direct the underclassmen.

The second portion of this Cruise Book contains your Sea Project. This Sea Project is similar in many respects to your first Sea Project with some changes. The Sea Project is an independent study unit that must be completed at regular announced intervals and turned in to the Engineering Training Officer. The Sea Project is not dependent on the ship's routine, the Lecture Schedule or whether you are in port or at sea. You are cautioned to use your time prudently and advantageously. As on your first Cruise, you have the whole ship as your personal laboratory, -- use it to advantage. Instructions for completing the Sea Project are included within the first few pages of that Section.

The third section contains supplementary information which may be of help to you in doing your Sea Project, for the lectures or during your daily routine.

This second Cruise proposes to develop your skills in the operation, maintenance, and repair of all the equipment which falls within the areas of responsibility of the Engineering Department. Safety will be stressed, and it should be a primary consideration before you attempt any job. Workmanship will be stressed also, and pride in your job is of prime importance, since your skill will determine the safety and comfort in which the rest of us will hope to conduct our work. A small compromise in the conduct of your skills may cost someone or many people severe or fatal injuries. Keep in your mind constantly, and never take for granted the fact that you are aboard an actual ship in a real operating situation. With that in mind, you are directed to instill this awareness by careful and patient instruction to the underclassmen.

To make this Cruise a pleasant trip as well as a rewarding educational experience you are urged to maintain a sense of good humor, be careful and considerate, show effort and initiative and again, you are urged to use your time to the fullest, so that on your last Cruise you may take over a Watch in full confidence of your abilities.

You are now directed to the first section of this Cruise Book to familiarize yourself completely with the organization which will guide all personnel for the duration of the Cruise.

INTRODUCTION

This will be your last Cruise, and your last opportunity to operate a ship with guidance and supervision always available. This will also be your last opportunity to put to practical use all of your theoretical and practical knowledge so far acquired. The time to ask questions, drill yourself, and gain experience before you enter the profession is now. We do not expect you to make mistakes because we feel that you should have sufficient experience and knowledge to think out a situation and arrive at a correct conclusion. However, if you need help, if you are not sure, please, seek out the Faculty and we will gladly help you. By the end of the Cruise, the Faculty expects each one of you to be able to carry out all of the duties and responsibilities that go along as an Engineering Officer aboard ship. The next time you go aboard ship, it will be expected of you, to discharge these duties and responsibilities without further training, preparation, or guidance. You may be senior officer of the watch, with a crew to supervise and the responsibility for the safety of all crew members and the economical operation of millions of dollars worth of equipment. This is not farfetched or unreal; this is the reason you are Licensed by the Federal Government.

The purpose of this last Cruise is to instill in you the awareness of the responsibilities and duties of the various positions that you will hold during the Cruise, and to complete and refine your techniques of operation, your methods of maintenance and repair, and your abilities at analysis of plant variations and emergency situations.

Added to this, you have the responsibility of training your underclassmen to do their jobs safely and in the correct manner. As you should be aware, you cannot run the ship by yourself. You need help, and you will have to train the underclassmen to do the jobs you need done. The Faculty will do most of the formal instruction; you will have to pitch in and help them gain the experience. On the first day out, those underclassmen who are on their first Cruise will fire your boilers and tend your water, and your boilers are the most important part of your plant. Help them, assist them and show them with patience and care and they will learn as you did.

This Cruise Book is divided into three sections. The first section is the organization of the ship and the personnel structure. You are directed to make yourself completely familiar with it and instruct your section as to their jobs, their duties and responsibilities and your expectations as their leader. The second section of this Cruise Book contains your Sea Project. This Sea Project is similar to your last one with some changes. Instructions for its completion are included within the first few pages of that section. The third section contains supplementary information which you may find useful in your daily routine, the Lecture Schedule or for writing your Sea Project.

You are advised to maintain a sense of good humor throughout the duration of the Cruise, to help keep up your morale, as well as the morale of your crew. Be patient and considerate, be firm but gentle, show initiative and effort, and your crew will help you to do your job in an atmosphere of cooperation. On the basis of the results you show in your ability to supervise, as well as on the basis of your proficiency in your professional work, the Faculty will judge you as being capable and ready to be an Officer in the American Merchant Marine.

You are now directed to the first section of this Cruise Book to completely familiarize yourself with the organization of the ship and to begin formulating the activities of your Section.

TRAINING ORGANIZATION

The following pages in this section describe the organization of the Engineering Department of the training ship and will be your guide for the whole of the cruise. You are directed to completely familiarize yourself with this organization so that you will know where you belong, to whom you are responsible, and at what time certain activities begin and end. With your cooperation and the cooperation of your classmates, this organization will provide a minimum of confusion, notices, announcements and the like, if adhered to.

Included in the organization are sections which will describe your duties and responsibilities, the time schedules you are to follow, the lectures to attend and suggestions on how to use your time fruitfully. Any questions you have about the organization should be referred to your section leader or to the Engineering Training Officer.

AT SEA ROUTINE

WATCHES

The watches that will be stood will conform with present merchant marine practice. The watches will provide the necessary practical experience you will need in the operation of a merchant vessel. The watches to be stood are:

a. 0000 - 0400	1200 - 1600
b. 0400 - 0800	1600 - 2000
c. 0800 - 1200	2000 - 2400

DAY WORK

The maintenance and repair of most of the machinery and systems will be carried out by a group who will collectively be termed the Day Work Group. Their working hours will be between 0800 and 1800.

MEALTIMES

The meals served aboard the training ship will be scheduled to allow everyone ample time to eat without interfering too much with watches and day work. Mealtimes will be scheduled as follows:

Breakfast	0730 - 0830
Lunch	1130 - 1230
Supper	1800 - 1900

SECTIONS

All the Cadets of the Engineering Department will be split up into six (6) sections as follows:

Section A	Section D
Section B	Section E
Section C	Section F

Each section will be made up of a number of seniors, juniors and sophomores. The assignments to the various sections will be made before embarking. Each section will remain intact for the duration of the Cruise and will be rotated through watch and day work assignments as a unit.

A Senior Cadet in each section will be assigned as Section Leader.

WATCH ORGANIZATION CHART

Chief Engineer

First Assistant

2nd Asst. Engineer	3rd Asst. Engineer	4th Asst. Engineer
Cadet Second	Cadet Third	Cadet Fourth
Cadet Jr. Eng.	Cadet Jr. Eng.	Cadet Jr. Eng.
Cadet Oiler	Cadet Oiler	Cadet Oiler
Cadet F/WT	Cadet F/WT	Cadet F/WT
Cadet Utility	Cadet Utility	Cadet Utility
Cadet Messenger	Cadet Messenger	Cadet Messenger
Cadet Evap. Oiler	Cadet Evap. Oiler	Cadet Evap. Oiler
Cadet Reefer	Cadet Reefer	Cadet Reefer

DAY ORGANIZATION CHART

Chief Engineer

First Assistant

Electrical Officer	Engine Training Officer
Electrician	Machinist/Plumber
Cadet Electrician	Cadet Machinist
Cadet Asst. Elec.	Cadet Plumber
Cadet Elec. Utility	Cadet Shopkeeper
Cadet Elec. Shopkeeper	Cadet Storekeeper

Cadet First Asst.

Cadet Maintenance

Cadet Utilitymen

SECTION ASSIGNMENTS

Each of the aforementioned sections will be initially assigned to a group of Cadets who will then be known and referred to as Section A, B, C, etc. The sections will be assigned job categories before embarking and will assume their duties as prescribed by the AT SEA or IN PORT routine schedules to follow. A section may be assigned initially to any one of the following job categories:

4 - 8 Watch

8 - 12 Watch

12 - 4 Watch

Machinist Section

Electrical Section

Maintenance Section

After the initial assignment a section will rotate through the various job categories as prescribed but retaining its original identity as Section A, B, C, etc.

LECTURE PERIODS

It is estimated that there will be about 36 days sea time during the Cruise and about 36 days in port and/or at anchor. During the 36 days at sea, each Cadet will participate in a formal lecture period to be held during the morning or the afternoon. The lectures will begin and end at the following hours:

0900 - 1100

1300 - 1500

When at sea the following sections will attend the above lecture periods:

4 - 8 Watch attends the 0900 - 1100 lecture

12 - 4 Watch attends the 0900 - 1100 lecture

Day Section attends the 1300 - 1500 lecture

8 - 12 Watch attends the 1300 - 1500 lecture

The Senior Class will attend a lecture for the Seniors; the Junior Class will attend a lecture for the Juniors; the Sophomore Class will attend a lecture for the Sohpomores; and the Freshmen will attend a lecture for the Freshmen.

The lectures at sea will be assigned to suit the specialty and availability of the lecturer and may be one of the following:

0900 - 1100	1300 - 1500
Chief Engineer	Chief Engineer
First Assistant	First Assistant

Second Assistant	Second Assistant
Third Assistant	Fourth Assistant
Engine Training Officer	Engine Training Officer
Electrical Officer	Electrical Officer
Medical Officer	Medical Officer

Daily Schedule 8 - 12 Watch - At Sea

watch call	0700
breakfast	0730
relieve watch	0750
watch	0800
watch relieved	1200
lunch	1200
lecture begins	1300
lecture ends	1500
study begins	1500
relieve for supper	1800
supper	1830
relieve call	1930
relieve watch	1950
watch	2000
watch relieved	2400

watch time	$8\frac{1}{2}$ hours
meal time	$1\frac{1}{2}$ hours
study time	3 hours
lecture time	2 hours
free time	2 hours
sleep	7 hours
total training time	13 hours
other	11 hours

<u>Daily Schedule 12 - 4 Watch - At Sea</u>

watch call	2330
relieve watch	2350
watch	2400
watch relieved	0400
sleep	
breakfast call	0700
breakfast	0730
study begins	0800
lecture begins	0900
lecture ends	1100
watch call	1115
lunch	1130
relieve watch	1150
watch	1200
watch relieved	1600
study begins	1600
supper	1800

watch time	8 hours
meal time	$1\frac{1}{2}$ hours
study time	3 hours
lecture time	2 hours
free time	$2\frac{1}{2}$ hours
sleep	7 hours
total training time	13 hours
other	11 hours

Daily Schedule 4 - 8 Watch - At Sea

watch call	0330
relieve watch	0350
watch	0400
watch relieved	0800
breakfast	0800
lecture begins	0900
lecture ends	1100
lunch	1200
study begins	1230
watch call	1530
relieve watch	1550
watch	1600
supper relief	1800
resume watch	1830
watch relieved	2000

watch time	$7\frac{1}{2}$ hours
meal time	$1\frac{1}{2}$ hours
study time	3 hours
lecture time	2 hours
free time	$2\frac{1}{2}$ hours
sleep	$7\frac{1}{2}$ hours
total training time	$12\frac{1}{2}$ hours
other	$11\frac{1}{2}$ hours

Daily Schedule Day Work - At Sea

morning call	0700
breakfast	0730
muster machine shop	0800

The Electrical Officer will supervise and direct all electrical work with the assistance of the Electrician and the Cadet Electricians.

The Machinist/Plumber will work with the First Assistant Engineer and/or the Engine Training Officer with the assistance of the Cadets in the Machinist Section.

The Cadet First Assistant Engineer will be available to the First Assistant Engineer for assigned duties in addition to supervising the Maintenance Section.

The Cadet Maintenance will divide the Cadet Utilitymen to clean and maintain all Engineering Department spaces such as the Engine Room, lockers, closets, store rooms, and other areas as assigned.

break for lunch	1145		
lunch	1200		
lecture begins	1300		
lecture ends	1500		
work resumes	1500		
work stops	1745	work time	7 hours
supper	1800	meal time	$1\frac{1}{2}$ hours
study begins	1830	study time	3 hours
		lecture time	2 hours
		free time	2 hours
		sleep	8 hours
		total training time	$12\frac{1}{2}$ hours
		other	$11\frac{1}{2}$ hours

ROTATION OF PERSONNEL - AT SEA

While the training ship is at sea all the Cadets will be rotated through all of the various job categories. A rotation of personnel will take place every three days. An example of how this rotation will take place is given below. To determine which section goes where, pick out the job category you are now in and follow the chart to the column headed Tomorrow.

Today			Tomorrow	
section	assignment	Time Between Watches	section	assignment
A	1600 - 2000	4	A	0000 - 0400
B	2000 - 2400	8	B	maintenance
C	1200 - 1600	16	C	0800 - 1200
D	machinist	10	D	0400 - 0800
E	electrical	16	E	machinist
F	maintenance	16	F	electrical

All watch changes will begin at midnight and will be completed by 0800 the next morning. There will be no interference or conflict with day or lecture routines.

Example:

Typical Rotation Scheme for Section A - At Sea:

Section A will go from the

4 - 8 Watch and the 9 - 11 lecture to

12 - 4 Watch and the 9 - 11 lecture to

8 - 12 Watch and the 1 - 3 lecture to

day maintenance section and the 1 - 3 lecture to

day electrical section and the 1 - 3 lecture to

day machinist section and the 1 - 3 lecture to

4 - 8 Watch and the 9 - 11 lecture . . .

and the cycle is repeated.

Senior Cadet Job Rotation Scheme - At Sea

If you are a Cadet in the Senior Class and your first assignment was as Cadet Second for the AT SEA routine, you will assume the following duties for the 36 days (approx.) that the ship will be at sea:

Title	Time	Job
Second	3 days	4 - 8
Third	3 days	12 - 4
Fourth	3 days	8 - 12
First Asst.	3 days	day
Electrical	3 days	day
Machinist	3 days	day
Second	3 days	4 - 8
Third	3 days	12 - 4
Fourth	3 days	8 - 12
First Asst.	3 days	day
Electrical	3 days	day
Machinist	3 days	day
	36 days at sea	

total watches stood at sea	72 watches
total time as Cadet Second	6 days
total time as Cadet Third	6 days
total time as Cadet fourth	6 days

total time as First Asst.	6 days
total time as Electrician	6 days
total time as Machinist	6 days

Junior Cadet Job Rotation Scheme - At Sea

If you are a Cadet in the Junior Class and your first assignment was as Cadet Jr. Engineer for the AT SEA routine, you will assume the following duties for the 36 days (approx.) that the ship will be at sea:

Title	Time	Job
Jr. Eng.	3 days	4 - 8
Oiler	3 days	12 - 4
Jr. Eng.	3 days	8 - 12
Maintenance	3 days	day
Asst. Elec.	3 days	day
Plumber	3 days	day
Oiler	3 days	4 - 8
Jr. Eng.	3 days	12 - 4
Oiler	3 days	8 - 12
Maintenance	3 days	day
Asst. Elec.	3 days	day
Plumber	3 days	day
	36 days at sea	

total watches at sea	72 watches
total time as Cadet Oiler	9 days
total time as Cadet Jr. Eng.	9 days
total time as Cadet Maintenance	6 days
total time as Cadet Asst. Elec.	6 days
total time as Cadet Plumber	6 days

Sophomore Cadet Job Rotation Scheme - At Sea

If you are a Cadet in the Sophomore Class and your first assignment was as Cadet F/WT for the AT SEA routine, you will assume the following duties for the 36 days (approx.) that the ship will be at sea:

Title	Time	Job
F/WT	3 days	4 - 8
F/WT	3 days	12 - 4
F/WT	3 days	8 - 12
Utility	3 days	day
Utility	3 days	day
Utility	3 days	day
F/WT	3 days	4 - 8
F/WT	3 days	12 - 4
F/WT	3 days	8 - 12
Utility	3 days	day

Utility	3 days	day
Utility	3 days	day
	36 days at sea	

total watches stood at sea	72 watches
total time as F/WT	24 watches
total time Cadet Utility - Watch	12 watches
total time Cadet Utility - Day	18 days

CADET UTILITY ASSIGNMENT CHART - AT SEA

The assignments below are for the members of the Sophomore Class who are rotated from the 8 - 12 watch onto day work. The Sophomore Cadet will assume each of the following jobs one each day. It will be up to the individual to make sure that he is assigned to the various jobs at the beginning of each day. The Section Leader should be notified of which job you are doing every morning during muster in the Machine Shop.

From the 8 - 12 Watch to the Maintenance Group as:

1. Cadet Utility - Wiper (Engine Room)
2. Cadet Utility - Wiper (Engine Room)
3. Cadet Utility - Wiper (Engine Room)

A rotation of personnel will take the section to the Electrical - Day Work Group and the following jobs:

1. Cadet Electrical Utility
2. Crew Maintenance (Crew Quarters)
3. Crew Maintenance (Crew Quarters)

The next rotation of personnel will be to the Machinist - Day Work Group and the following jobs:

1. Engineer's Yeoman (Engineer's Office)
2. Engineer Officer's Steward or Crew Maintenance (Crew Quarters)
3. Shopkeeper (Machine Shop) or Storekeeper

The section would then be rotated to the 4 - 8 Watch and each

Sophomore Cadet would assume one of the watch jobs as follows:

1. Cadet F/WT - Port Boiler
2. Cadet F/WT - Stbd Boiler
3. Cadet Utility - Watch

AT SEA SCHEDULE

The following schedule will detail the rotation of personnel for the days spent at sea while the AT SEA routine is in effect. The listing of section designators (i.e., A, B, C, etc.) in this schedule is arbitrary, however, the sequence is not. In order to locate your section and determine the sequence, circle your section according to the watch you have the first time sea watches are set. For example: If you are in section E and you are assigned the 12 - 4 watch, circle letter "A" and follow the sequence of "A" through the schedule. Unless extraordinary conditions exist, you will follow "A" throughout the Cruise as your sequence of job rotations at sea.

AT SEA SCHEDULE

Days at Sea	Watch	Section on Watch	Machinist	Electrical	Maintenance
1 2 3	12-4	A			
	4 - 8	B			
	8 - 12	C			
	day		D	E	F
4 5 6	12 - 4	B			
	4 - 8	D			
	8 - 12	A			
	day		E	F	C
7 8 9	12 - 4	D			
	4 - 8	E			
	8 - 12	B			
	day		F	C	A
10 11 12	12 - 4	E			
	4 - 8	F			
	8 - 12	D			
	day		C	A	B
13 14 15	12 - 4	F			
	4 - 8	C			
	8 - 12	E			
	day		A	B	D

At Sea Schedule - Continued

Days at Sea	Watch	Section on Watch	Machinist	Electrical	Maintenance
16 17 18	12 - 4	C			
	4 - 8	A			
	8 - 12	F			
	day		B	D	E
19 20 21	12 - 4	A			
	4 - 8	B			
	8 - 12	C			
	day		D	E	F
22 23 24	12 - 4	B			
	4 - 8	D			
	8 - 12	A			
	day		E	F	C
25 26 27	12 - 4	D			
	4 - 8	E			
	8 - 12	B			
	day		F	C	A
28 29 30	12 - 4	E			
	4 - 8	F			
	8 - 12	D			
	day		C	A	B

At Sea Schedule - Continued

Days at Sea	Watch	Section on Watch	Machinist	Electrical	Maintenance
31 32 33	12 - 4	F			
	4 - 8	C			
	8 - 12	E			
	day		A	B	D
34 35 36	12 - 4	C			
	4 - 8	A			
	8 - 12	F			
	day		B	D	E
37 38 39	12 - 4	A			
	4 - 8	B			
	8 - 12	C			
	day		D	E	F

I N P O R T R O U T I N E

MEALTIMES

The mealtimes in port will be the same as at sea. Supper may be moved up to an earlier time if convenient and feasible.

LECTURE PERIODS

The AT SEA lecture routine will be suspended for the duration of the stay in port. Special lectures will be scheduled as the opportunity exists on subjects of interest to all.

SECTIONS

The structure and organization of the sections as described will not change in port.

WATCHES

Port watches for Engineer Cadets will be 8 hour watches to be stood as follows:

0000 - 0800

0800 - 1600

1600 - 2400

This practice is similar to the watch routine of present merchant ships. The full section will stand these watches. There will be no skeleton crews except in cases of emergency.

The changeover from the AT SEA to the IN PORT routine will be announced well in advance of F. W. E. Anchorage will be considered as AT SEA, and the AT SEA routine will be in force.

The IN PORT watch and day work routine will provide a section rotation every day as per the schedules to follow.

IN PORT AND DAY WORK ROUTINE

The following schedule will detail the rotation of personnel for the days spent in port while the IN PORT routine is in effect. The listing of section designators (i.e., A, B, C, etc.) in this schedule is arbitrary, however, the sequence is not. In order to locate your section and determine the sequence, circle your section according to the watch you have the first time port watches are set. For example: if you are in Section E and you are assigned the 8 - 4 watch upon arrival, circle letter "A" and follow the sequence of "A" through the schedule. Unless extraordinary conditions exist, you will follow "A" throughout the Cruise as your sequence of job rotations in port.

IN PORT SCHEDULE

Days in Port	Watch	Section on Watch	Machinist	Sleep	Maintenance
1	12 - 8				
	8 - 4	A	D	E	F
	4 - 12	B			
2	12 - 9	C			
	8 - 4	D	A	C	B
	4 - 12	E			
3	12 - 8	F			
	8 - 4	B	A	F	E
	4 - 12	C			
4	12 - 8	D			
	8 - 4	E	B	D	C
	4 - 12	F			
5	12 - 8	A			
	8 - 4	C	B	A	F
	4 - 12	D			
6	12 - 8	E			
	8 - 4	F	C	E	D
	4 - 12	A			
7	12 - 8	B			
	8 - 4	D	C	B	A
	4 - 12	E			

In Port Schedule - Continued

Days in Port	Watch	Section on Watch	Machinist	Sleep	Maintenance
8	12 - 8	F			
	8 - 4	A	D	F	E
	4 - 12	B			
9	12 - 8	C			
	8 - 4	E	D	C	B
	4 - 12	F			
10	12 - 8	A			
	8 - 4	B	E	A	F
	4 - 12	C			
11	12 - 8	D			
	8 - 4	F	E	D	C
	4 - 12	A			
12	12 - 8	B			
	8 - 4	C	F	B	A
	4 - 12	D			
13	12 - 8	E			
	8 - 4	A	F	E	D
	4 - 12	B			
14	12 - 8	C			
	8 - 4	D	A	C	B
	4 - 12	E			

In Port Schedule - Continued

Days in Port	Watch	Section on Watch	Machinist	Sleep	Maintenance
15	12 - 8	F			
	8 - 4	B	A	F	E
	4 - 12	C			
16	12 - 8	D			
	8 - 4	E	B	D	C
	4 - 12	F			
17	12 - 8	A			
	8 - 4	C	B	A	F
	4 - 12	D			
18	12 - 8	E			
	8 - 4	F	C	E	D
	4 - 12	A			
19	12 - 8	B			
	8 - 4	D	C	B	A
	4 - 12	E			
20	12 - 8	F			
	8 - 4	A	D	F	E
	4 - 12	B			
21	12 - 8	C			
	8 - 4	E	D	C	B
	4 - 12	F			

In Port Schedule Continued

Days in Port	Watch	Section on Watch	Machinist	Sleep	Maintenance
22	12 - 8	A			
	8 - 4	B	E	A	F
	4 - 12	C			
23	12 - 8	D			
	8 - 4	F	E	D	C
	4 - 12	A			
24	12 - 8	B			
	8 - 4	C	F	B	A
	4 - 12	D			
25	12 - 8	E			
	8 - 4	A	F	E	D
	4 - 12	B			
26	12 - 8	C			
	8 - 4	D	A	C	B
	4 - 12	E			
27	12 - 8	F			
	8 - 4	B	A	F	E
	4 - 12	C			
28	12 - 8	D			
	8 - 4	E	B	D	C
	4 - 12	F			

In Port Schedule Continued

Days in Port	Watch	Section on Watch	Machinist	Sleep	Maintenance
29	12 - 8	A			
	8 - 4	C	B	A	F
	4 - 12	D			
30	12 - 8	E			
	8 - 4	F	C	E	D
	4 - 12	A			
31	12 - 8	B			
	8 - 4	D	C	B	A
	4 - 12	E			
32	12 - 8	F			
	8 - 4	A	D	F	E
	4 - 12	B			
33	12 - 8	C			
	8 - 4	E	D	C	B
	4 - 12	F			
34	12 - 8	A			
	8 - 4	B	E	A	F
	4 - 12	C			
35	12 - 8	D			
	8 - 4	F	E	D	C
	4 - 12	A			

In Port Schedule Continued

Days in Port	Watch	Section on Watch	Machinist	Sleep	Maintenance
36	12 - 8	B			
	8 - 4	C	F	B	A
	4 - 12	D			
37	12 - 8	E			
	8 - 4	A	F	E	D
	4 - 12	B			
38	12 - 8	C			
	8 - 4	D	A	C	B
	4 - 12	E			
39	12 - 8	F			
	8 - 4	B	A	F	E
	4 - 12	C			
	12 - 8	D			

Section Rotation Scheme - In Port - Illustration

Below are the job assignments through which each section will be rotated during the time the IN PORT routine is in effect. This is only an illustration, but it will give you a description of what assignments you will have, and at what times you will be free of any formally assigned duties.

days in port	job assignment
1	8 - 4 watch, free evening
2	Machinist group - day work, free evening
3	Machinist group - day work, free evening
4	Free day
5	12 - 8 morning watch, sleeping privilege in morning, free afternoon and evening
6	free morning, 4 - 12 night watch
7	Maintenance group - day work, free evening
8	8 - 4 day watch, free evening
	Etc.

For the Cruise:

Approximate no. of port watches	7
Approximate no. of hours in port watch	56
Approximate no. of hours of day work	112
Approximate no. of hours free and study time	140
Approximate no. of special lectures	7

JOB ROTATION FROM IN PORT TO AT SEA

The changeover from the IN PORT routine to the AT SEA routine will take place at such time before Standby so that the AT SEA routine may be resumed in the sequence described earlier. Due consideration will be made to provide sufficient rest between IN PORT and AT SEA watches.

J O B   D E S C R I P T I O N S

Title: Cadet First Assistant Engineer

Time: Day Work

Class: Senior

1. The Cadet First is the senior Cadet in the Engineering Department who is directly responsible to the Officer First Assistant Engineer for the discharge of the duties and responsibilities assigned to him and the duties and responsibilities assigned to the Cadets under his supervision.
2. The Cadet First will supervise and direct all those Cadets who are assigned to the Day Work group, and will assign and follow-up on all jobs that he distributes. The direct supervision of these Cadets will be carried out through the Cadet Machinist, Cadet Electrician, and the Cadet Maintenance.
3. The Cadet First will be responsible for the presence, appearance, conduct and workmanship of all Cadets on the Day Work shift.
4. The Cadet First will be assigned and directed to other duties and responsibilities as needed by the Officer First Assistant Engineer.
5. The Cadet First will conduct the following daily routine unless otherwise specified:

   0800 - Muster all Day Work Cadets in the Machine Shop for work assignments. Fill out muster sheet and file in the Engineering Training Office.

1000 - Knock-off all Cadets on Day Work for smoke and coffee break, if possible.

1015 - Resume work; inspect progress of maintenance section.

1145 - Knock-off all Cadets on Day Work for Lunch.

1245 - Muster all Day Work Cadets and dismiss to assigned Lecture Area.

1300 - Lecture begins.

1500 - Resume daily work schedule.

1745 - Knock-off all Day Work Cadets for Supper.

6. The Cadet First shall make himself available to the Officer First Assistant Engineer at all times and aid him in the operations, maintenance, and repair of all engineering spaces and equipment, in the assignment of jobs, the conduct of drills and exercises, and the overall administration of the Engineering Department.

7. The Cadet First will assist the Officer First in operating, maintaining and repairing the following:

   a. ship's service refrigeration system

   b. scuttlebutts (individual units)

   c. air conditioning system

   d. ship's service generators

e. steering engine

f. all deck machinery

g. ventilation system

h. galley equipment

i. main engine and gears

j. shafting, bearings, stern tube

k. maintenance of all inventory and operating data for the above

Title: Cadet Machinist

Time: Day Work

Class: Senior

1. The Cadet Machinist is the senior Cadet in the Machinist Section of the Day Work Group. He will be directly responsible to the Ship's Machinist-Plumber in the discharge of all duties and responsibilities assigned to him and the duties and responsibilities assigned to the Cadets under his supervision.

2. The Cadet Machinist will assist the Ship's Machinist-Plumber in the assigned work which will concern:

   a. overhaul and mechanical machinery

   b. repair of mechanical equipment

   c. welding, brazing, soldering, cutting by oxy-acetylene methods

d. electric-arc welding or cutting

e. work on the lathe, drill press, shaper, and use and care of all hand and power tools.

f. all plumbing and pipe work concerning air, water, oil, steam, and gas.

g. cleanliness, good order, and inventory of all machine shop tools and supplies.

h. other duties as directed.

Title: Cadet Electrician

Time: Day Work

Class: Senior

1. The Cadet Electrician is the senior Cadet in the Electrical Section of the Day Work Group. He will be directly responsible to the Ship's Electrician in the discharge of all duties and responsibilities assigned to him and the duties and responsibilities assigned to the Cadets under his supervision.

2. The Cadet Electrician will assist the Ship's Electrician in the assigned work which will concern:

   a. overhaul, repair, and maintenance of all electrical equipment aboard ship with the exception of the radar unit and the gyroscope.

   b. cleanliness, good order and inventory of the electrical shop and all tools and parts.

c. completion and up-dating of all electrical records and logs.

d. other duties as directed.

Title: Cadet Second Assistant Engineer

Time: 4 - 8 Watch

Class: Senior

1. The Cadet Second is the senior Cadet on the 4 - 8 Watch and is directly responsible to the Officer Second Assistant Engineer for the discharge of the duties and responsibilities assigned to him and the duties and responsibilities assigned to the Cadets under his supervision.

2. The Cadet Second will assist the Officer Second in the conduct of the 4 - 8 Watch including the following:

a. operation of the entire plant

b. supervision of subordinates

c. sampling, analysis and dosing of boiler water

d. maintenance of correct trim and heel and overall stability of the vessel by use of fuel, water and ballast.

e. pumping of settlers

f. blowing tubes

g. maintenance and repair of boilers, feed pumps, heat exchangers, feedwater system, fuel oil service system, fuel oil and ballast transfer system, combustion and feedwater control apparatus.

h. inventory records for all equipment listed in subpart (g.).

i. completion of oil, boiler water and Engine Room logbooks.

j. safe working habits of all subordinates

k. cleanliness and good order of the Engine Room

l. other duties as directed.

Title: Cadet Third Assistant Engineer

Time: 12 - 4

Class: Senior

1. The Cadet Third is the senior Cadet on the 12 - 4 Watch and is directly responsible to the Officer Third Assistant Engineer for the discharge of the duties and responsibilities assigned to him and the duties and responsibilities assigned to the Cadets under his supervision.

2. The Cadet Third will assist the Officer Third in the conduct of the 12 - 4 Watch including the following:

   a. operation of the entire plant

   b. supervision of subordinates

   c. inventory, storage, purification, and sampling of all lube oil and greases

d. operation, maintenance and repair of the ship's service lube oil system, generator lube oil system, air compressor, shaft bearings, refrigeration compressors and steering engine lube oil requirements.

e. completion of lube oil, greases, and other petroleum products inventory records, except fuel oil, and the Engine Room logbook.

f. safe working habits of all subordinates.

g. cleanliness and good order in the Engine Room

h. other duties as directed.

Title: Cadet Fourth Assistant Engineer

Time: 8 - 12 Watch

Class: Senior

1. The Cadet Fourth is the senior Cadet on the 8 - 12 Watch and is directly responsible to the Officer Fourth Assistant Engineer for the discharge of the duties and responsibilities assigned to him and the duties and responsibilities assigned to the Cadets under his supervision.

2. The Cadet Fourth will assist the Officer Fourth in the conduct of the 8 - 12 Watch including the following:

   a. operation of the entire plant

   b. supervision of subordinates

   c. operation, maintenance and repair of the fresh water system, fire system, sanitary system, sounding of all water tanks, main and auxiliary condensate systems, condensers and all evaporators.

d. completion of all water, and inventory records and the Engine Room logbook

e. safe working habits for all subordinates

f. cleanliness and good order of the Engine Room

g. other duties as directed.

Title: Cadet Asst. Electrician

Time: Day Work

Class: Junior

1. The Cadet Asst. Electrician will be responsible to the Cadet Electrician. He will assist the Cadet Electrician in the performance of the jobs and duties assigned to his section. He will maintain the Electrical logbooks and records, and assist in any other way as directed.

Title: Cadet Maintenance

Time: Day Work

Class: Junior

1. The Cadet Maintenance will be responsible to the Cadet First Asst. Engineer. He will supervise the Cadet Utilitymen assigned to him, in cleaning, painting and storing supplies in

spaces assigned to the Engineering Department. These spaces include the Engine Room, lockers, shaft alley, storage bins, and other spaces as directed. The distribution of work each day will be handled by the Cadet Maintenance each morning through the Cadet First Asst. Engineer. The Cadet Maintenance will supervise and help those who are assigned as:

a. Engine Room Wipers

b. Engineer's Office Yeoman

c. Crew Quarter's Maintenance

Title: Cadet Plumber

Time: Day Work

Class: Junior

1. The Cadet Plumber will be responsible to the Cadet Machinist. The Cadet Plumber will assist the Cadet Machinist in all phases of work but will concentrate on the use of the tools and materials associated with steam, water, air, oil and gas piping systems.

Title: Cadet Oiler

Time: On Watch

Class: Junior

1. The Cadet Oiler will be responsible to the Cadet Engineer of the Watch. He will be responsible for the entries in the

Oiler's Log, calling the relieving watch and checking the steering engine at midwatch. He will also assist the Cadet Engineer in the overall operation of the plant, pumping all bilge areas, inspection and lubrication of all machinery, cleaning and changing water pump strainers and assist or relieve in the fireroom if necessary.

Title: Cadet Junior Engineer

Time: On Watch

Class: Junior

1. The Cadet Junior Engineer will be responsible to the Cadet Engineer of the Watch. He will assist the Cadet Engineer in the overall operation of the plant, and in particular, shall supervise the activities of the Fireroom. He will also maintain a close watch on all operating machinery, supervise and/or operate the ship's evaporators, help to prepare logbooks and stand by the operating platform when directed.

Title: Cadet Fireman/Watertender

Time: On Watch

Class Sophomore

1. The Cadet Fireman/Watertender will be responsible to the Cadet Junior Engineer. He will fire one or both boilers, regulating fuel, air and water to maintain steam pressure and water level

under all operating conditions. He will clean and change burners every watch, and fuel oil pump suction and discharge strainers when necessary.

Title: Cadet Electrical Utility

Time: Day Work

Class: Sophomore

1. The Cadet Electrical Utility will be responsible to the Cadet Asst. Electrician. He will assist the Electrical Group in the maintenance and repair of electrical equipment, keeping of electrical logbooks and records and assist as otherwise directed.

Title: Cadet Shopkeeper

Time: Day Work

Class: Sophomore

1. The Cadet Shopkeeper will be responsible to the Cadet Machinist. He will maintain the cleanliness and good order of the Machine Shop, store rooms, and lockers; assist in the selection and use of tools and supplies and operate such machine tools as directed.

Title: Cadet Utility - Day Work

Time: Day Work

Class: Sophomore

1. The Cadet Utility - Day Work will be responsible to the Cadet Maintenance. He will clean up, paint, chip, and keep in good order the spaces and areas assigned to him. He will provide such assistance as is needed in keeping the safety and good order of all engineering spaces and provide assistance when needed in the overhaul, maintenance and repair of machinery and equipment to the day work group.

Title: Cadet Utility - Watch

Time: On Watch

Class: Sophomore

1. The Cadet Utility - Watch will be responsible to the Cadet Engineer of the Watch. He will serve as messenger to the watch and will be understudy and assistant to all watch-standers in the performance of their duties, by participating in the operation of the entire plant and in the specific functions of each Watch.

SENIOR CLASS LECTURES

1. Standing Watches
2. Maneuvering With Engines & Boiler
3. Emergency Procedures - Boiler
4. Emergency Procedures - Engine
5. Emergency Procedures - General
6. Reciprocating Pump Design & Operation
7. Centrifugal Pump Design & Operation
8. Rotary pump Design & Operation
9. D. C. Ship's Generators
10. A. C. Ship's Generators
11. D. C. & A. C. Motor Testing & Repair
12. Electric Motor Controllers
13. Boiler Maintenance Procedures
14. Pump Maintenance Procedures
15. Steering Engine
16. Refrigeration Systems - Operation
17. Evaporators - High Pressure
18. Evaporators - Low Pressure
19. Operation of Automatic Valves - Part I
20. Operation of Automatic Valves - Part II
21. Automatic Combustion Control - Bailey
22. Automatic Combustion Control - General Regulator
23. Anchor Windlass, Winches and Capstans
24. Dehumidification & Ventilation Systems
25. Emergency Diesel Generator
26. Safety in the Engine Room
27. Marine Engineering Rules & Regulations
28. Review
29. Review
30. Written Examination Part #1
31. Written Examination Part #2
32. Review of Test
33. The Navigating Bridge
34. Open
35. Open
36. Open

TEXAS MARITIME ACADEMY
TEXAS A&M UNIVERSITY

CRUISE LECTURE SERIES
MARINE ENGINEERING

LECTURE #1 (Sample)

CLASS SENIOR

TITLE STANDING WATCHES

OBJECTIVE To review past watch standing procedures and to define the duties and responsibilities of Senior Watch Standers aboard merchant ships.

REFERENCES King, P.M.E., pp. 413-414

Ford, P.M.D.E., pp. 245-269

Bischoff, M.R.E., pp. 178-188

Fox, M.S.E.T., pp. 3-4, 347

Noel, W.O.G., pp. 3-26

MacGibbon, M.E.K., p. 508

LECTURER ____________________

DATE ____________________

REMARKS ____________________

____

____

____

____

LECTURE TOPICAL OUTLINE

#1 STANDING WATCHES

1. Duties of the Fireman/Watertender

   a. control of water level

   b. control of combustion air

   c. control of fuel oil pressure, firing rate - no. of burners

   d. steam pressure

   e. steam temperature - superheat control

   f. control of fires - positioning of burners, air registers

   g. smoke

   h. changing burners - proper procedure - safety

   i. cleaning burners - proper procedure

   j. cleaning of f.o. pump discharge strainer - proper procedure

   k. maneuvering - help needed

   l. cleanliness of fireroom - drip pans - safety aspect

   m. procedure for gage glass blow-down-frequency

   n. boiler care general - peep holes and glasses, fuel oil burner lines, thermometers, pressure gages

2. Duties of the Oiler

   a. oiler's log

   b. oiler's rounds - procedure

   c. steering engine check

   d. pumping bilges, drain wells, cofferdames - frequency

   e. oiling machinery - equipment, frequency, safety

f. maneuvering - make-up feed, recirculating valves on feed pump and condensate pump, bell book entries

g. plant operation - pumps, lines, heaters, adjustments, limits of freedom to operate

h. calling relieving watch

3. Duties of the Engineer

a. making relieving round - what to notice, where to go

b. how to be relieved - what to ask; where information is; what happened previous watch; check presence of your watch-standers and proper relieving; when to take over and allow past watch to leave Engine Room

c. log books - reading of past watch information; notice changes; prepare new sheet; proper care; entries in pencil; no erasures; type of entries in remarks section

d. fireroom operation - changing and cleaning burners; blowing tubes

e. operation and blow-down of high pressure evaporators, check lube oil purifier, distill tank, status of standby equipment, pumping settlers, etc.

f. use of senses - hearing, seeing, smelling, touching, tasting to detect faulty operation and steady conditions

g. how to feel bearings

read thermometers

interpret vacuum

suspect steam leaks

suspect oil leaks

suspect other leaks

h. how to secure plant immediately in case of emergency

i. watch engineer's relationship to bridge

j. bridge orders - information flow, cooperation, use of telephone and telegraph

k. how to prepare to be relieved

4. Watch Essentials:

a. boilers

b. generators

c. main engine

TEXAS MARITIME ACADEMY
TEXAS A&M UNIVERSITY

CRUISE LECTURE SERIES
MARINE ENGINEERING

LECTURE #6 (Sample)

CLASS SENIOR

TITLE RECIPROCATING PUMP DESIGN AND OPERATION

OBJECTIVE To familiarize each Senior Cadet with the nomenclature, types, purpose and operation of representative types of reciprocating pumps.

REFERENCES King, P.M.E., pp. 318-319, 327
Osbourne, M.M.E.M., Vol. I., pp. 14: 10-50, 4: 78
Seward, M.E., Vol. II, pp. 229-241
Bupers, P.M.E., pp. 231-236

LECTURER ______________________________

DATE ______________________________

REMARKS ______________________________

____

____

____

____

LECTURE TOPICAL OUTLINE

#6 RECIPROCATING PUMP DESIGN AND OPERATION

1. Types:
    - a. simplex
    - b. duplex
    - c. triplex
    - d. single acting
    - e. double acting
    - f. direct acting
    - g. indirect acting
    - h. fixed stroke
    - i. variable stroke
    - j. power pumps
2. Design requirements
    - a. flow rate
    - b. piston speed
    - c. steam and cylinder pump size
    - d. suction lift
    - e. discharge pressure
3. Mechanical details
    - a. D-slide valve action
    - b. piston valve action
    - c. valve stem and tappets

d. D-slide valve tappets

1) inside adjustable

2) outside adjustable

e. rocker arms, pins, bushings, bearings, crossheads

f. steam cylinder

g. pump cylinder

h. steam piston and valves

i. pump piston and valve chests

j. valves

1) Sims

2) Kinghorn

3) composition

k. setting valves

4. Operation

a. starting

b. securing

c. operation faults

1) piston knock

2) incomplete stroke

3) loses suction

4) groaning

5) jamming

TEXAS MARITIME ACADEMY
TEXAS A&M UNIVERSITY

CRUISE LECTURE SERIES
MARINE ENGINEERING

LECTURE #7 (Sample)

CLASS SENIOR

TITLE CENTRIFUGAL PUMP DESIGN AND OPERATION

OBJECTIVE To familiarize each Senior Cadet with the nomenclature, types, purpose and operation of representative types of centrifugal pumps

REFERENCES King, P.M.E., pp. 332-336

Seward, M.E., Vol. II, pp. 204-228

Osbourne, M.M.E.M., Vol. I, p. 14: 51-95

Bupers, P.N.E., pp. 245-247

LECTURER ______________________________

DATE ______________________________

REMARKS ______________________________

____

____

____

____

LECTURE TOPICAL OUTLINE

#7 CENTRIFUGAL PUMP DESIGN AND OPERATION

1. Types
    a. single stage
    b. multiple stage
    c. volute
    d. diffuser
    e. vertical
    f. horizontal
    g. radial flow
    h. axial flow
2. Design requirements
    a. flow rate
    b. impeller speed
    c. impeller diameter
    d. discharge pressure
    e. suction lift
3. Mechanical details
    a. impeller
    b. wearing ring
    c. packing, stuffing box, gland, gland nuts
    d. casing joint, gasket, jack screws; volute
    e. diffuser ring
    f. vane shape

1) straight (turbine)

2) forward curve

3) backward curve

g. wearing ring clearance and lubrication

h. packing lubrication

i. cavitation, vapor-binding

j. Nash vacuum pump

4. Operation

a. starting

b. recirculation

c. priming pump

d. securing

e. operation faults

1) no suction, poor suction

2) pump freezes

3) low discharge pressure

4) packing burns

5) vibration

TEXAS MARITIME ACADEMY
TEXAS A&M UNIVERSITY

CRUISE LECTURE SERIES
MARINE ENGINEERING

LECTURE	#15 (Sample)
CLASS	SENIOR
TITLE	STEERING ENGINE
OBJECTIVE	To acquaint Senior Cadets with the construction, operation, maintenance and emergency procedures of steering engines of the electro-hydraulic type
REFERENCES	King, P.M.E., pp. 385-395 Osbourne, M.M.E.M., Vol. II, pp. 20: 3-48 Seward, M.E., Vol. II, pp. 439-457
LECTURER	______________________
DATE	______________________
REMARKS	______________________

LECTURE TOPICAL OUTLINE

#15 STEERING ENGINE

1. Construction

   a. rams

   b. rudder stock

   c. tiller

   d. rapson slide

   e. variable capacity pump

   f. telemotor sender

   g. telemotor receiver

   h. gyro

   i. six-way valve

   j. follow-up gear (feedback)

2. Operation

   a. sequence of events for manual port helm

   b. sequence of events for manual starboard helm

   c. sequence for automatic gyroscope orders

   d. follow-up gear (feedback)

   e. effect of slamming on rudder and follow-up repositioning

3. Maintenance

   a. air in system - bleeding

   b. ram packing

   c. telemotor oil tank

   d. automatic purge and fill valve

e. electrical maintenance

f. greasing and oiling

4. Emergency Procedures

a. failure of one electrical motor in operation

b. failure of both electrical motors

c. failure of telemotor sender

d. failure of one ram

e. failure of both rams

MARINE ENGINEERING TRAINING PROGRAM

SECTION TWO

PART 8

JUNIOR CLASS LECTURES

JUNIOR CLASS LECTURES

1. Oiler's Duties
2. Junior Engineer's Duties
3. Boiler Operation - Lighting Off
4. Boiler Operation - At Sea & Maneuvering
5. Boiler Operation - Securing
6. Reciprocating Pump Operation
7. Centrifugal Pump Operation
8. Gear Pump Operation
9. Refrigeration System Operation
10. Evaporators - High Pressure
11. Evaporators - Low Pressure
12. Main Steam Cycle
13. Auxiliary Steam System
14. Fuel Oil System
15. Lube Oil System
16. D. C. Ship's Generators
17. A. C. Ship's Generators
18. Motors and Controllers - Operation
19. Automatic Combustion Control
20. Steering Engine
21. Turbines
22. Gears
23. Shafting, Thrust Bearing, Stern Tube
24. Starting Up the Plant - Part I
25. Starting Up the Plant - Part II
26. Securing the Plant - Part I
27. Securing the Plant - Part II
28. Safety in the Engine Room
29. Deck Machinery
30. Emergency Procedures - Part I
31. Emergency Procedures - Part II
32. Review (Requested Subjects)
33. Review (Requested Subjects)
34. The Navigating Bridge
35. Open
36. Open

TEXAS MARITIME ACADEMY
TEXAS A&M UNIVERSITY

CRUISE LECTURE SERIES
MARINE ENGINEERING

LECTURE #3 (Sample)

CLASS JUNIOR

TITLE BOILER OPERATION - LIGHTING OFF

OBJECTIVE To outline the proper procedures for preparing a ship's boiler for operation and to describe the proper procedures for lighting off and putting it on the line

REFERENCES ______________________________

____

____

____

LECTURER ______________________________

DATE ______________________________

REMARKS ______________________________

LECTURE TOPICAL OUTLINE

#3 BOILER OPERATION - LIGHTING OFF

1. Check exteriors and interiors

   a. all handhole plates in place

   b. all manhole plates in place

   c. all foreign matter out of furnace

   d. air registers and burners properly connected

   e. all doors, panels, sections properly in place and secure

   f. stack cover removed

   g. all valves, gage glasses installed and operable

   h. bilge area clear of all combustibles

   i. all work begun on the boiler is completed

   j. all persons out of the boiler

2. Lining Up

   a. flue gas air heater bypassed

   b. steam air heater secured

   c. bulkhead steam stop valve opened, closed lightly

   d. main steam stop valve (or superheater steam stop valve) opened and closed lightly

   e. superheater vent valve opened

   f. superheater drain valve opened

   g. economizer vent valve opened, closed if water issues

   h. air cock opened

   i. desuperheater stop valve opened then closed lightly

j. generator steam stop valve opened then closed lightly

k. chemical feed line stop valve closed

l. fuel oil recirculating valve opened

m. air registers opened

n. forced draft fan damper opened

o. combustion control board on manual

p. gage glass valves opened

q. automatic feedwater control valve jacked open

r. main and auxiliary feedwater stop valves opened

s. main and auxiliary feedwater check valves closed

3. Water Level

   a. if water is below the gage glass and a feed pump is running, fill boiler through auxiliary feed system till water is 1 inch in gage glass

   b. if boiler is full, drain boiler TO BILGE using water wall drains till water is 1 inch in gage glass

4. Fires

   a. open all air registers, start forced draft fan on slow speed and purge furnace for 5 minutes

   b. prepare torch, port tip burner

   c. recirculate fuel oil till temperature at header is at least 150 degrees F.; pressure at the header should be 125-150 $\#/in^2$

   d. close registers, light torch, open root valve

e. insert torch into peep hole, put fire under burner tip

f. open burner valve

g. if no fire at the burner in five (5) seconds, close burner valve and re-purge furnace for 5 minutes and try again

h. if burner lights, open burner valve all the way and open air register slowly to full open

5. Raising Steam

a. allow 4-6 hours to bring boiler up to line pressure

b. rotate fires

c. close air cock at 20 $\#/in^2$

d. close superheater DRAIN valves only at 100 $\#/in^2$

e. cut in boiler to auxiliary steam system at 400 $\#/in^2$

f. cut in generator steam stop at 440 $\#/in^2$

g. close superheater vent valve

PART 9

SOPHOMORE CLASS LECTURES

SOPHOMORE CLASS LECTURES

1. Fireman/Watertender Duties - Part I
2. Fireman/Watertender Duties - Part II
3. Boilers - Construction
4. Boilers - Operation
5. Fuel Oil System
6. Main Steam Cycle
7. Lube Oil System
8. Salt Water System
9. Fresh Water System
10. Evaporators - High Pressure
11. Evaporators - Low Pressure
12. Reciprocating Pump Operation
13. Centrifugal Pump Operation
14. Gear Pump Operation
15. Turbines
16. Gears and Thrust Bearings
17. Shaft and Stern Tube
18. Steering Engine
19. Ship's Generators
20. Motors and Electrical Maintenance
21. Refrigeration System
22. Air Compressors
23. Safety in the Engine Room
24. Deck Machinery
25. Insulation Types, Applications, Maintenance
26. Emergency Procedures - Boilers
27. Emergency Procedures - General
28. Oiler's duties
29. Junior Engineer's Duties
30. Lathe Operation
31. The Navigation Bridge
32. Review
33. Review
34. Open
35. Open
36. Open

PART 10

SEA PROJECT INSTRUCTIONS

INSTRUCTIONS

The following pages contain your Sea Project which is to be completed individually by you and turned in for grading at announced intervals. The Sea Project is a self-study unit which is independent of your lecture schedule and section assignments.

The Sea Project is broken down into assignments, one of which should be completed each week, regardless of whether the ship is in port or at sea. Sufficient time has been allowed each day to study and complete the assigned questions. The Sea Project assignments require detailed work, concentration and honest effort. You are advised to use your time fruitfully, make use of your own textbooks, those in the ship's library and ask questions of the Officers. The finished Sea Project along with notes taken during the lectures will provide you with invaluable reference material for use later in course work and review for your License examination. The more you put into it, the more you will have to refer to later.

Minimum List of Required Materials:

- 1 black cover, 3 ring loose leaf binder
- 500 sheets, 3 ring loose leaf paper, red margin, narrow ruled, heavy weight paper, $8\frac{1}{2}$ x 11
- 50 sheets, white, unlined, extra heavy paper - Beckett or similar - $8\frac{1}{2}$ x 11
- 10 sheets, white, extra heavy paper, unlined, 12 x 14

2 bottles blue-black ink

2 fountain pens, narrow or medium point

4 pencils, wood, #2 or F

1 red gum eraser

1 soap eraser

1 30° - 60° plastic triangle

1 45° plastic triangle

1 scale, graduated 1/16"

1 straight edge, at least 12" long

Format:

A. Written Work

1. All written work is to be handed in for grading done in blue-black ink on narrow-ruled 3-hole loose leaf paper bound in a black 3-ring binder - or - work can be typed on plain paper double spaced and turned in covered in a 3-ring binder.

2. A white library card is to be taped onto the inside of the front cover of the binder in the extreme upper left hand corner and will have typed onto it the following information:

Last Name, First, Middle	Class Year
Grade Initial	Grade Initial
Assign #1__________	Assign #6__________
Assign #2__________	Assign #7__________
Assign #3__________	Assign #8__________

Assign #4__________ Assign #9__________

Assign #5__________ Assign #10__________

3. Each sheet turned in for grading should have the assignment number and the Cadet's name printed on the first line, for example:

Assign #6 John S. Doe

4. Any written work, illustrations, lists, or continuing work should be started two (2) lines below the assignment number and name and ON ONE SIDE OF THE SHEET ONLY.

5. Descriptions and general information may be written in sentence and paragraph form.

6. All procedures should be written in step by step form, identifying each step by number or letter.

7. All lists of parts, points of consideration, lists of features, advantages, disadvantages, etc., should be written in list form, one under the other, identified by number of letter, and not in sentence form.

Example:

A reciprocating pump is one of our basic types of pumps used aboard ship. Reciprocating pumps may be classified as:

a. simplex
b. duplex
c. single acting

8. All written work may be done single spaced. Double, triple, and other spacing is advised between paragraphs and after lists to make reading easier and also allows one to make additions later on.

9. All spacing, numbering and lettering systems, and overall method of presentation should be uniform throughout the Sea Project.

10. The question should be re-written onto the answer sheet before the answer is given.

11. Your grade for the Sea Project will be a composite grade made up and influenced by the following factors:

    a. correctness of material presented

    b. clear explanation of detail

    c. amount and type of information

    d. neatness

    e. spelling and grammar

    f. completion at dates due

B. Drawings and Sketches

1. All drawings and sketches should conform to all the conventions of mechanical and electrical drafting. The drawings and sketches may be done in a freehand style, however, perspective, relative size, scale, layout, clarity and dimensioning and labeling should approximate a professional instrument

drawing. All lines should be of a single and continuous nature. No sloppy, unclear, or scratchy drawings will be accepted. Instrument drawings are preferred.

2. All drawings and sketches shall be done in pencil. No ink should be used on a drawing or sketch except the originator's name.

3. The name of the Cadet should appear in the upper right hand corner of the drawing or sketch sheet when the sheet is viewed long side vertical with holes to the left.

PART 11

SENIOR CLASS SEA PROJECT

MARINE ENGINEERING SEA PROJECT - SENIORS

ASSIGNMENT #1 - GENERAL (Sample)

Answer each of the following questions as completely as you can.

1. Enumerate the general and specific duties of the Second, Third and Fourth Assistant Engineers as they pertain to any merchant vessel.

2. Describe in detail the reason why you should make a round of the Engineering spaces, how you do it, what you see and do, and what results if any.

3. a. List the common causes of inadequate condenser vacuum.
   b. Why is losing vacuum an emergency situation?
   c. How would you determine vacuum by other than a bourdon tube vacuum gage?

4. If a boiler feed pump in operation fails to maintain the water level in the boilers, what would you do? What are the possible reasons for its failure? Describe in detail how you would start the standby pump and secure the faulty one.

5. Why should the water level or its temperature in the direct-contact heater on modern ships not be permitted to rise or fall any appreciable amount?

6. What is meant by "bilge injection?"

7. Make a complete sketch of the lube oil service system aboard the training ship, including all lines, valves, instruments and arrows indicating direction of flow.

8. List the procedure for starting and securing the lube oil purifier aboard the training ship.

9. List the properties of a good turbine lube oil and explain them. Why is only one kind of oil used for turbines, gears, generators and line shaft bearings?

10. Make a complete sketch of and describe the ship's service generator turbine governor system. Define feedback and droop.

11. Briefly state the purpose and the operation of each of the following:

    a. pneumercators
    b. tachometers
    c. torsion meters
    d. planimeters
    e. manometers
    f. steam calorimeters
    g. thermoelectric pyrometers
    h. electrical salinity indicator

12. Explain the reason for installing a recirculating line on most centrifugal boiler feed pumps, and on main and auxiliary condensate pumps.

End of Assignment #1.

MARINE ENGINEERING SEA PROJECT - SENIORS

ASSIGNMENT #4 - ENGINES (Sample)

1. Write a detailed description of the main engine aboard the training ship beginning with the main steam stop to the tail shaft.

2. Make a large and detailed sketch of the turbine governor system including the throttle valves and write a complete description of its function for each of the following:

   a. overspeed
   b. lube oil pump stops
   c. gravity tank level goes down

   How do you increase or decrease the overspeed setting? Why is there a manual override on the governor? How does it work?

3. What is the purpose of the thermometer on the high pressure steam chest of the high pressure turbine? How would you use the thermometer when warming up the engine? What would fluctuations in the temperature indicate? What would you do if fluctuation occurred? What are some causes for fluctuations?

4. Make a drawing of a turbine thrust bearing and write up a complete description of it, including

   a. how the oil wedge is formed
   b. how the clearances may be adjusted
   c. the oil flow through the bearing
   d. conditions of maximum wear

5. Sketch a half-sectional view of the high pressure bleed valve on the main turbine, explain how and why it works and how it should be operated and used during various plant operating conditions. What maintenance is required on this valve?

6. Explain how temperature variations and accompanying expansion and contraction of engine parts is compensated for. Make sketches of the various devices used to illustrate how they work.

7. Explain the use of the nozzle control valves on the main engine. Explain throttle loss, and describe how it can be increased and decreased.

8. Explain the jacking gear, its function, purpose, use and U.S.C.G. Rules and Regulations concerning it.

9. For this question, answer each part with a list of steps indicating what you would check, investigate, do, or let happen.

   You are at sea with the engine at maximum rated horsepower and the following is noticed by you:

   a. lube oil pressure to the gears is 3 $\#/in^2$
   b. a high pitch whine not heard before is apparently coming from the L.P.
   c. the forward bearing housing on the H.P. turbine catches fire
   d. the turbine overspeeds suddenly and the governor shuts the engine down
   e. the main circulator stops
   f. the pressure reducing valve for steam to the air ejector controlling diaphragm ruptures.

10. a. Explain how turbine packing is constructed, how it is installed, how it works. Illustrate with sketches.
    b. Describe and sketch the turbine gland seal system aboard the training ship. Devise an automatic system which will function under all operating conditions unassisted.

11. Write a description of the diesel of the emergency diesel generator set, and sketch the various systems needed for its operation, i.e., fuel oil, lube oil, exhaust, etc.

End of Assignment #4.

MARINE ENGINEERING TRAINING PROGRAM

SECTION THREE

PART 14

GENERAL WATCH PROCEDURE

G E N E R A L W A T C H P R O C E D U R E

CADET ENGINEER

1. Report to steering engine after watch call and check each of the following:

   a. electric motors

   b. expansion tank level

   c. motor controllers

   d. ram response and movement

   e. leaks

   f. oil level in pump sumps

   g. leaks of any kind

   h. security of all loose gear and fire hazards

2. Report to Engine Room and make a survey type round of important engineering spaces to ascertain general condition of the plant. Items to be checked in particular are:

   a. forced draft fans and motors

   b. evaporator operation

   c. refrigeration systems operation

   d. feed heaters

   e. voltage, amperage, generators

   f. main feed pump

   g. condenser operation

   h. fireroom operation

   i. bilges

3. Relieve the watch at 10 minutes to the hour by reporting to the Cadet Engineer on the operating platform.
4. Check the presence of and proper relieving of all members of the watch.
5. Make a complete round of all spaces in and around the main engine room including the shaft alley, reefer flat, evaporator flat and machine shop.
6. Review logbook of the previous two watches, the engine room bulletin board and any other pertinent information available.
7. Instruct Cadet Junior Engineer and Fireman/Watertender to begin changing burners. Cadet Engineer should be either in Fireroom to give assistance if necessary or standby the operating platform until all burners have been changed.
8. Routine watch duties should now be undertaken which are required of each particular watch.
9. At mid-watch dispatch Cadet Oiler to check steering engine.
10. In the last hour of the watch all bilges, drain wells, and cofferdams should be pumped dry.
11. A last round should be made in the last half hour of the watch to ascertain all operating conditions for information for the relieving watch.

CADET OILER

1. Report below in advance of the time to relieve the watch and make a survey round of all spaces to ascertain the operation

of the plant. Particular items to be checked are:

a. presence of leaks

b. loose gear

c. unusual sounds, noises, odors, temperatures, pressures

d. condition of bilges

e. number and type of equipment in operation

2. Relieve the Cadet Oiler at 10 minutes before the hour by reporting to him on the operating platform.

3. Make a complete round as required to check all machinery and spaces and complete the Oiler's Log for the first hour.

4. Stand-by and be available to the Cadet Engineer and Cadet Junior Engineer for assistance.

5. Complete a round every hour to fill in the Oiler's Log.

6. At the end of the third round inform the Cadet Engineer of your intention to go to the steering engine. When given permission, report to the steering engine room directly and check each of the following:

a. motors

b. motor controllers

c. unusual sounds, noises, odors

d. leaks of any kind

e. expansion tank level

f. loose gear of any kind

g. presence or dangers of fire

Upon return to the Engine Room report findings to the Cadet Engineer.

7. Before the last round start bilge pump with priming pump and priming line open and begin pumping bilges. Make your last round while pumping the various spaces.
8. At forty (40) minutes till the end of the watch request permission to call the relieving watch from the Cadet Engineer.
9. Secure all bilge pumping before being relieved.

CADET JUNIOR ENGINEER

1. Report below to make a round of the evaporator and refrigeration flats and the lower engine room or machinery flat. In particular check each of the following:
   a. evaporator operation
   b. refrigeration and air conditioning compressors
   c. main feed pump
   d. all operating equipment and shaft alley
   e. all bilge areas
   f. fireroom operation
2. Relieve the Cadet Junior Engineer at 10 minutes before the hour in the Fireroom
3. Make a complete round of the lower Engine Room, shaft alley and other spaces. Supervise and assist the preparation for changing burners. Change burners.
4. Assist Cadet Engineer as directed.

5. One half hour before the watch is relieved make a complete round of lower Engine Room and Fireroom to ascertain all operating conditions for information for the relieving watch.

FIREMAN/WATERTENDER

1. Report directly to Fireroom and make a round of all equipment and areas around boilers, feedpumps and fuel oil equipment.
2. Relieve the watch by reporting to the Fireman/Watertender in the Fireroom 10 minutes before the hour.
3. Make a complete round of the Fireroom to ascertain all operating conditions.
4. Prepare to change burners. Secure permission from Junior Engineer to commence changing burners.
5. Clean burners. Operate the Fireroom by maintaining and making necessary adjustment to:

   a. main steam pressure

   b. main steam temperature

   c. fuel oil pump discharge pressure

   d. fuel oil heater outlet temperature

   e. fuel oil settling tank temperature

   f. smoke and stack temperature

   g. boiler water level

   h. boiler feed pump discharge pressure

   i. burner flames

6. Prepare to be relieved 30 minutes before the end of the watch by making a complete round of the Fireroom to ascertain all operating conditions for information for the relieving watch.

CADET UTILITY

CADET EVAP. OILER

CADET REEFER

1. Report directly to respective assigned areas and make a complete round of that area.
2. Relieve the watch by reporting to the respective watch stander at 10 minutes before the watch.
3. Carry out specific and general duties of the watch as assigned.
4. Make a complete round of all respective responsibility areas to ascertain operating conditions for information for the relieving watch, one half hour before the end of the watch.

PART 15

SPECIFIC WATCH PROCEDURE

S P E C I F I C   W A T C H   P R O C E D U R E

4 - 8 WATCH

1. Regular blowing of tubes will be done on the afternoon watch as soon as watch is relieved and respective rounds have been completed. Tubes will be blown <u>before</u> changing burners.
2. Boiler water should be tested after tubes have been blown and burners changed. Dosing of boiler water should be done if necessary after testing.
3. Pumping of settlers should be done on the morning watch. Heat applied to the various storage tanks should be done well in advance of pumping if necessary.
4. Change-over of settlers will be done at noon, and fuel oil consumption records kept on a noon to noon basis at sea and in port.
5. Boiler continuous blow-down should be commenced if salinity is above 4 grains per gallon to the make-up feed evaporator. Also, continuous blowdown should commence if phosphate or alkalinity concentrations are too high. Blowdown should be started if phosphate radical concentration is above 70 ppm or alkalinity above 11.5 pH.
6. Condensate should be checked for salinity content whenever suspicions of contamination exist and at the close of the watch for entry of the reading into the logbook. Condensate testing may be done by tapping samples from the condensate

pump and at the air ejector condensers inlet head vent.

7. Maintenance and repair work that is done on watch should be done after all of the above has been completed and according to the judgement of the Officer in charge.

12 - 4 WATCH

1. The lube oil purifier should be run when the ship is at sea and any other time when it is judged necessary. The cleaning, maintenance and repair of the purifier should be done according to the operational experience encountered. Repair of the purifier should be done as soon as possible to return this vital piece of equipment to service.
2. The lube oil temperature from the main coolers should be maintained at 110° F. or as advised by the vendor of the oil. Also, the lube oil temperature from the generator lube oil cooler should be a steady 110° F. to provide even governor control.
3. Lube oil discharge strainers should be changed over every afternoon watch and cleaned.
4. Lube oil suction strainers should be changed over every time F.W.E. is rung and plant conditions allow such a job to progress in safety.
5. Lube oil discharge strainers on each generator should be changed-over and cleaned every twenty-four hours of generator operation.

6. Lube oil samples should be taken once a week and allowed to settle in a suitable test tube for three weeks for comparison purposes and as indicators of purifier performance.
7. Condensate should be checked for salinity content whenever suspicions of contamination exist and at the close of the watch for entry of the reading into the logbook. Condensate testing may be done by tapping samples from the condensate pump and at the air ejector condenser inlet head.

8 - 12 WATCH

1. The make-up feed evaporator should be started for production of distill water whenever total distill water on hand is approximately 60-75% maximum capacity or less. Highest salinity content of distill water acceptable for boiler feed use is .1 grains per gallon.
2. The salt water evaporator for use for production of potable water for domestic purposes will be started upon advice of the Chief and/or First Assistant Engineers. Maximum acceptable salinity content of potable water is 3 grains per gallon.
3. Transfer of water for stability purposes will be done only on the advice of the Chief and/or First Assistant Engineers.

PART 16

MAINTENANCE POINTERS

M A I N T E N A N C E P O I N T E R S

Maintenance, in general, is the work accomplished by suitable personnel for keeping or holding machines, tools, instruments, fixtures and ships in a state of efficiency within the limits set by their design. Maintenance includes the repair of machines, tools, instruments, fixtures and ships, but does not include any alteration which would change the design or the efficiency.

The primary need for maintenance is that no material either natural or synthetic is completely wear resistant when subjected to motion, friction, contact with chemical elements or compounds, exposed to electromagnetic energy phenomena, or any combination of the above. This suggests that any object is in a continual state of decay. Maintenance, its procedures and implementation acts to combat decay of one kind or another in order to realize a maximum usefulness of the object before it becomes inefficient due to uncontrolled wear or obsolesence.

The primary reasons for maintenance are the following:

1. insure continued operation of any object within the limits of its design
2. insure against the possibility of a breakdown or failure of an object which can lead to:
   a. unsafe conditions
   b. loss of valuable time
   c. increased damage by continued operation

3. realize the full economic life of a machine or other object to aid administration in cost control programs.

Basically there are two types of maintenance policies which can be carried out. These two types are:

1. after a failure or breakdown has occurred, maintenance is required in order to repair what is broken or malfunctioning and return the object to useful functions;
2. preventive maintenance, which entails regular inspections of, and needed adjustments made to objects on the basis of some known indicator of wear, maladjustment, amount of deposit, color change, odor, or other, to keep the objects performing efficiently with the least possibility of failure or breakdown.

There are certain agents which are responsible for inducing either decay, deterioration or wear, and they can act singly or in conjunction with one or more in random combinations. The following is a list of some of these agents.

1. free oxygen
2. moisture
3. heat
4. sunlight and other electromagnetic wavelength spectrums
5. chemical compounds or elements, either liquid, solid, or vapor
6. certain pestiferous insects, bacteria, fungi, and other organisms

7. friction

8. radioactivity, alpha, beta, and gamma radiation, and high energy neutron exposure

The more common maintenance problems arise from problems which are either inherent in the operation performed or are manifestations of negligence. Some of the causes for the more common maintenance problems are:

1. collection of dust
2. collection of dirt
   a. chips
   b. sand
   c. soil
   d. shavings
   e. other debris - all of the above dry or mixed with a bonding agent such as water or oil
3. leaks of any kind
4. vibration

Maintenance records can take on many forms and involve many systems, yet their completeness is their primary advantage. Incomplete information is an incomplete history, and assumptions made for interims can lead to trouble. Whatever system is in use or whatever system you establish, the guidelines that can or should be followed are:

1. record the running time of the equipment or the dates between maintenance work

2. record what caused you to perform the work, such as routine check, maladjustment, bearing wear, rust, misalignment, normal wear, etc.

3. record what spare parts were used and all identifying information for that part

4. have clear instructions available with your records so that your successor or temporary replacement knows:

   a. how the records are kept

   b. how they are used

   c. what entries to make

   d. how your filing system works

The following is a list of ten suggestions which could be used in performing good maintenance work:

1. Familiarity with the machine or object on which maintenance procedures are to be carried out is a prime prerequisite before any work is begun - no matter what kind.

2. Familiarity with the special tools for maintenance will go a long way in preventing damage to the object, the person, or someone else, and will prevent the loss of valuable time.

3. A thorough review of the maintenance work to be done should reveal most of the safety hazards involved, and these hazards should be removed or compensated for by providing extra help, equipment or time.

4. The manufacturer's instruction booklets and manuals which should accompany any piece of equipment should be consulted to reveal special tools, seals, joints, procedures, and warranty and guarantee stipulations.
5. In all situations, allow sufficient time to complete a maintenance procedure to prevent hasty assembling, loss of parts, and in general sloppy and non-professional work.
6. It is expected that maintenance personnel and all those engaged in maintenance work have an informed respect for the materials with which they work; this respect should be exercised to the fullest to prevent secondary damage and marring of equipment.
7. Keep records of your own of what you do and how you do it and they will provide you invaluable information in the future for improving your maintenance procedures and showing up weak and dangerous points of design in the object.
8. Try at all times to ascertain the causes for your maintenance work and problems and try to correct these causes as soon as possible to reduce your maintenance requirements.
9. It goes almost without saying that maintenance after a failure or breakdown wastes time, money, and effort when the breakdown could have been prevented - and yet, preventive maintenance is an expensive luxury which can be made fruitful and profitable when used as an element of instruction.

10. Remember that designers and planners of equipment and facilities are human, and that your wrath and frustration during down time is folly if not used as the impetus for sound corrective thinking.

G R A D E S   A N D   G R A D I N G

The grading system that will be used on the cruises will be the same for all classes. It was devised to show up the performance of each Cadet in each type of study, as well as his performance in the overall.

The final grade you will receive will be one grade, either A, B, C, D, or F. The grade will apply to all the course work you will undertake which directly concerns Marine Engineering. This final grade is made up of four parts, each of which is weighted by a certain percentage. These four parts are:

Watch grade average	25%
Day work grade average	25%
Sea project grade average	40%
Test	10%
	100%

At the end of each watch a Watch Grade Report will be filled out by the Cadet Engineer. The Cadet Engineer will be responsible for evaluating the performance of each of his subordinates on watch, or all of the members of his section. He will then submit this Report to the Officer on watch who will then grade the Cadet Engineer. The criteria for grading should be the duties and responsibilities as outlined in the Job Descriptions in Section One of this Cruise Book, the general and specific watch procedures outlined in Section Three, and an evaluation of the ability and performance of the individual Cadet concerned.

The Cadet Engineer will then be responsible for the delivery of this Watch Grade Report to the Engineering Training Officer immediately after the watch is relieved.

At the end of a work day a Day Work Grade Report will be filled out by the Cadet First Assistant Engineer. The Cadet First will be responsible for evaluating the performance of each of the Cadets that he supervised that day. The other cadets on day work should be graded by the Officer or Cadet to whom they were responsible. The Cadet First will then submit the Report to the First Assistant Engineer who will then grade the Cadet First. The criteria for grading will be the same as outlined for the Watch Grade Report.

The Sea Project will be graded by the Engineering Training Officer and by other Officers in the Engineering Department. Instructions about the Sea Project completion dates, format, etc., are in Section Two of the Cruise Book.

Tests will be given covering subject matter pertinent to the Cruise and will be announced in advance.

Grades on the Watch Grade Report, Day Work Grade Report and Sea Project will be entered as follows:

VG - very good

G - good

S - satisfactory

U - unsatisfactory

The above descriptive grades will be converted to a numerical scale for averaging. The final average of all grades will then be assigned a letter grade, and entered into the Cadet's official record.

If the grade of unsatisfactory is given, the individual Cadet may expect additional study requirements in order to overcome the deficiency. In the case of the Sea Project, assignments may be required to be resubmitted. The recommendations for additional study and resubmission of written work will come from the originator of the grade and should be submitted to the Engineering Training Officer for approval. Under no circumstances should additional study requirements be given to any Cadet without approval. This is necessary to prevent overloading an individual and most important, to prevent passing on false, misleading or inadequate information.

Any grade given by a Cadet may be changed by the Officer in charge. The reasons for the change will be explained by the Officer.

TEXAS MARITIME ACADEMY
DEPARTMENT OF MARINE ENGINEERING

GRADE REPORT

NAME______________________________CRUISE__________

CLASS__________MAJOR__________________DATE__________

COURSES:

MARE 200 (4)	203 (2)	102 (1)	M.E. 309 (1)
300 (4)	204 (2)	_____	_____
400 (4)	302 (1)	_____	_____

GRADES: SEA PROJECT / TESTS

SEA PROJECT		TESTS
Assign. #1_____	#6_____	TEST #1_____
#2_____	#7_____	#2_____
#3_____	#8_____	#3_____
#4_____	#9_____	#4_____
#5_____	#10_____	#5_____

ORAL EXAMINATION

boiler operation	_____	lube oil system	_____
fuel oil system	_____	salt water service	_____
generator operation	_____	mn. fd. pump operation	_____
paralleling	_____	recip. pump operation	_____
refrigeration cycle	_____	evaporator operation	_____
auxiliary plant	_____	steering engine	_____
throttle operation	_____	stern tube & tailshaft	_____
main engine	_____	equip. identification	_____
steam/water cycle	_____	safety	_____
raising vacuum	_____	emergency procedures	_____
fire fighting	_____	watch standing	_____

VG very good (3.0) S satisfactory (1.0)
G good (2.0) U unsatisfactory (0.0)

AVERAGES:

Sea Project Grade average	X .40	_____
Test grade average	X .10	_____
Day work grade average	X .25	_____
Watch grade average	X .25	_____

Final average _____

FINAL GRADE _____

____
Engineering Training Officer

TEXAS MARITIME ACADEMY
TRAINING SHIP TEXAS CLIPPER

DAY WORK GRADE REPORT

INSTRUCTIONS: Enter last name and first name of the Cadet as provided for below. Use the following grading scale for evaluation:

VG	very good	S	satisfactory
G	good	U	unsatisfactory

MACH./ ELEC./ MAIN. (circle one)   DATE: ____________ SECTION ________

	name	grade
Cadet First Asst. Engr.		
Cadet Machinist		
Cadet Electrician		
Cadet Plumber		
Cadet Asst. Electrician		
Cadet Maintenance		
Cadet Utility		
Cadet Electrical Utility		
Cadet Shopkeeper		

____________________ ____________________
print name of supervising officer   signature of supervising officer

COMMENTS: ____________________

____

TEXAS MARITIME ACADEMY
TRAINING SHIP TEXAS CLIPPER

WATCH GRADE REPORT

INSTRUCTIONS: Enter last name and first name of the student as provided for below. Use the following grading scale for evaluation:

VG	very good	S	satisfactory
G	good	U	unsatisfactory

WATCH:__________ DATE:__________ SECTION__________

	name	grade
Cadet Engineer		
Cadet Junior Engineer		
Cadet F/WT		
Cadet Oiler		
Cadet Utility		

print name of supervising officer

signature of supervising officer

COMMENTS:

A P P E N D I X C

PREPARATIONS ITINERARY

EXHIBIT I

MEMORANDUM TO: Superintendent, Faculty and Staff
Galveston, Texas

FROM: KLaus V. Luehning and Faculty and Staff at
College Station, Texas

SUBJECT: Preparations Itinerary - Cruise 1965

REF: Faculty Meeting December 4, 1965 Superintendent's
request for recommendations

1. On the request of the Superintendent, the Faculty and Staff at College Station met at three separate occasions to formulate the itinerary presented in the following pages. The guiding criteria for the itinerary as presented below are:

   a. past experience in enrollment and registration
   b. location of records and accounts
   c. availability of personnel
   d. time available
   e. training program
   f. ship's organization

   It is the hope that the itinerary will provide guidance to all those engaged in the project. Suggestions for changes and additions are respectfully solicited.

Klaus V. Luehning

PREPARATIONS ITINERARY - CRUISE 1965

Friday January 15

Faculty meeting at Galveston
Subject: Cruise 1965

a. preparations itinerary
b. organization progress
c. training program progress
d. ship and itinerary
e. crew requirements

Sunday January 31

Registration of students at Galveston
Time: 1400 hours
Place: Dining Room
Personnel: All students
3 Galveston Faculty
D. P. Cannon
J. H. Allen
K. V. Luehning or
D. C. Mercer

Monday February 1

Beginning of Classes

Week of February 17-21

Faculty meeting at Galveston
Subject: Cruise 1965

a. organization and training program progress
b. finalize watch and rotation schedules
c. outline of activities 1-14 June
d. Freshman Program requirements

Monday March 1

1. Inoculation of College Station Freshmen begins at University Hospital to continue until all required series are complete.

2. Lists of required materials needed for completing the academic work for the Cruise submitted to Academic Aide for comparison, integrating and ordering. Included are items as follows:

paper	ink and pens	mimeograph
pencils	projectors	ditto
graph paper	film	photocopier
plotting sheets	slides	stationary
charts	blackboards	typewriters
notepads	chalk	adhesive tape
erasers	stencils	etc.

Week of March 15-19

Faculty meeting at Galveston
Subject: Cruise 1965

a. organization and training program progress
b. Freshman Program progress
c. Faculty and Staff shipboard conduct, appearance, policies, chain of command, etc.

Monday March 15

1. Freshmen Cadets incoming in June notified of acceptance into program by TMA and directed to take the Navy physical at nearest recruiting facility. Those applicants not yet accepted for admission into the program by the University Registrar will also be so notified.

2. Lists of required and desired books to be part of the Ship's Library submitted to the Academy Librarian for inventory, ordering and packing by 7 June. Lists should come from all Heads of Departments for each program.

Friday March 26

All materials for publication comprising the Deck and Engine Training Programs, Shipboard Rules and Regulations, and supplementary material, should be at College Station for final typing, proofreading and printing.

Friday April 2

1. Requirements of Officers and Faculty and Staff for all participants in the Cruise 1965 in the way of uniforms should be

finalized. Included in the order should be:

a. type of uniforms
b. rank of individual
c. insignia requirements

2. Uniform requirements of all students should be prescribed.

a. type
b. rank
c. insignia
d. supplementary ordering or deletion

3. All facets of the Freshmen Program should be complete and ready for reproduction. Included in the Program should be:

a. organization
b. rules and regulations
c. type of supervision
d. courses available
e. class schedule
f. needed supplies
g. instructor requirements
h. uniform requirements
i. in port activities

Friday April 16

Projected Stores List should be drawn up and compared with ship's inventory. Probable requirements for both departments should be included in absense of concrete information. Requisitions should be written and bids let. Ship's doctor submit list of required hospital supplies with suppliers available.

Saturday May 1

Applications received after May 1 will no longer be considered for inclusion in the Freshman Program. The minimum time allowance from date of application to acceptance by Registrar and Marad is approximately six weeks.

Monday May 3

1. Complete bunkering schedule placed with vendor on the basis of bids received. Bid received and accepted on basis of service, availability and grade of fuel oil.

Contacts with other vendors should be made to establish ability to deliver and service requirements. Contacts should be made for:

a. fuel oil, lube oil, kerosene, special oils and greases
b. refrigerants
c. boiler compounds
d. water
e. steward dept. stores
f. general stores: paint, line, hawser, wire, tackle, spare parts, tools, metal stock, etc.
g. gyro and radar servicing
h. charts, almanacs, etc.
i. chronometer servicing
j. Mechanical and electrical machinery spare parts
k. oxygen, acetylene, carbon dioxide
l. welding supplies and parts

Warehouse or other storage facility to be made available to receive all supplies and parts as delivery can be made. No perishable or safety hazardous goods unless proper precautions can be made

2. Officers, Faculty and Staff Inoculation records brought up to date.

Friday May 14

1. Section assignments made and confirmed. Section assignments for the students should be carefully made on the basis of personality, academic ability, and conduct records. Two Sections, one Engine, and one Deck, assigned to first port watch beginning at 1600 Sunday June 6, 1965. The regular Port Watch Schedule will follow.

2. All Cruise Books, Rules and Regulations and other information should be distributed and carefully explained to all students.

3. Section assignments for Registration for the Cruise made and reproduced for distribution at this time.

Monday May 24

All departments should be fully manned at this time to facilitate orientation, familiarization and preparation. Unlicensed personnel to inventory and pack and supervise shift of all supplies and parts to warehouse or other storage area for placement on ship.

Saturday May 29

1. Last day of examinations for the Spring semester

2. Payroll and ship's fund papers, processing and accounting and distribution completed by Accountant.

Monday May 31

All Officers, Faculty and Staff meet in Galveston for a meeting to determine the following:

a. ship whereabouts and status
b. ship requirements
c. ship movements
d. itinerary changes
e. status of ordered supplies
f. ship's inventory
g. other

Tuesday June 1

Report to ship for familiarization and preparation. The following could or should be checked or done:

a. status of machinery
b. fuel and water
c. inventory, supplies
d. completion of all shipyard work
e. prepare to start the plant
f. ship's office
g. office supplies and equipment
h. keys; inventory, sorting, distribution, issue
i. status of ordered supplies
j. stowage facilities for uniforms and ship's service goods

Wednesday June 2

0800 Start the Plant

1300 Generator on the line, disconnect shore power.

a. emergency and general lighting
b. sanitary water
c. potable water
d. fire alarm systems
e. ventilation systems

f. power and water on deck to check all fire stations
g. make and break all electric circuits
h. test steering engine, radar, gyro, general alarm system, emergency diesel generator, IC systems, batteries
i. all bridge electrical gear tested.

Thursday June 3

Friday June 4

Saturday June 5

Bunker fuel oil and lube oil upon arrival of barge. Take on Deck and Engine stores. Start ship's service refrigeration systems - dehydrate and purge, charge if necessary, check all automatic controls. Wash all reefer boxes with hot soda solution, drain, and wipe dry. Reefer system in operation for pull down of all compartments by 1700 June 3. Lube oil system started and purifier on for main system dehydration. Distill water consumption periodically checked and requirements forecast. All water systems checked for leaks, pressure and water availability. All ventilation systems checked. Main engine on jacking gear and vacuum raised for dock trails. Both boilers checked for tightness. All pumps tested. Stern gland checked. All water, lube oil and fuel oil strainers checked and cleaned.

All Freshmen uniforms delivered and arranged for distribution. All Ship's service store goods delivered and stored. All school and office supplies delivered and stored.

Required deck machinery tested. All bridge electrical systems tested.

Steward department stores delivered of a perishable nature upon confirmation of refrigeration system integrity and required temperatures reached in boxes.

Shifting ship from shipyard to berth.

Sunday June 6

1300 - 1600 Vistors

1600 - Assigned Deck and Engine Sections begin Port Watch Schedule.

1800 - All Cadets, Deck, Engine and Freshmen report aboard no later than 1800 June 6 for berthing assignments. Each Cadet should have all his gear. Rooms assigned should be stowed and cleaned and any deficiencies reported in writing to the Engineer's Office..

No Liberty or Leave

Work assignments and watch assignments for all Cadets should go into effect upon arrival.

No meals will be served.

Monday June 7

No Visitors. No Liberty

0730 Breakfast

0800 Begin day work. All sections except night watch turn to.

0830 Registration of Cadets

D. P. Cannon
James Allen
M Dodge
R. Forrest
A. Saville

Registration by sections both Deck and Engine as previously assigned, May 15.

0900	Sections E
0930	Sections F
1000	Sections D
1030	Sections A
1100	Sections B
1130	Sections C

Freshman Cadets in a ship Orientation Program.

1200 End of Registration for TMA Cadets
Lunch

1300 Registration for Freshmen Cadets. Registration will proceed with all freshmen present to receive instructions for completing required paper work and collection of fees. Uniforms to be issued after each freshmen has received receipt for payment of fees beginning at 1400.

1700 Supper. Registration will continue till completion.

Supplementary room assignments and general cleaning of living areas to continue in the evening, or, the ship's organization and rules and regulations reviewed with all available

Tuesday June 8

No Visitors - No Liberty

0730 - 0830 Breakfast

0800 Regular Routine. Stowage of gear and housekeeping Freshmen Cadets in an Academic Orientation Program, meeting instructors, schedule of classes, schedule of work assignments, etc.

1000 Freshmen report to Ships Hospital for inoculation

1200 - 1300 Lunch

1300 Freshmen Cadets meet with Accountant and administrative staff, Fill out Maritime Commission and TMA enrollment forms. All forms will be pre-sorted and arranged in folders. Upon completion of forms they will be sent to College Station for processing. Separate information sheet to be supplied in duplicate and filled out by each freshman, containing personal data for processing forms and for cases of emergency. Oath of Office administered.

Wednesday June 9

Regular watch and day work routine. No visitors and no liberty. All Engine Room equipment changed to standby units to check all systems and operation. Fire and boat stations and drills run through once for orientation. All deficiencies in equipment and living areas corrected.

Wednesday evening all Engine Cadets participate in a Safety Program of lectures and films. Entire Engine Department will participate.

Thursday June 10

All supplies, materials, spare parts and other stowed, inventoried or delivered by this date. Full engine dock trails and testing of all pertinent systems. Fire and Boat drills conducted. Safety Program of the Engineering Department to commence Thursday evening.

Friday June 11

Saturday June 12

Open House and liberty for Cadets

EXHIBIT II

April 15, 1965

MEMORANDUM TO: Faculty, Staff, Students
Texas Maritime Academy

FROM: Department of Marine Engineering

SUBJECT: Policy of the Marine Engineering Department regarding Sea Projects

The Sea Projects which will be completed by the students during the cruise will be graded and kept under lock and key by the Department as long as the student is enrolled in the Academy. The completed Sea Projects will not be returned to the student unless the Department decides the Projects will serve as instructional material for a particular course. The Projects will then be distributed at the beginning and collected at the end of the course. Failure to return the Project to the Department will result in a failing grade for that course.

All three Sea Projects will be available for courses in License preparation but will be collected prior to graduation. The individual graduate may receive his Sea Projects in their entirety at the beginning of the first regular fall or spring semester after his graduation.

The above restrictions are necessary to provide security for the completed Sea Projects as well as to provide security for the information contained therein.

Klaus V. Luehning
Engineering Training Officer

EXHIBIT III

14 May 1965

MEMORANDUM

To: Faculty and Staff, Department of Marine Engineering

From: Klaus V. Luehning
First Assistant Engineer
Engineering Training Officer

Subj: Watch Assignments, Watch Schedules, and Training Program

Aboard the T/S Texas Clipper the normal at sea watches to be stood are the 12-4, 4-8, and the 8-12. The Watch Engineers are assigned to these watches as follows:

Manges, John L. ....4-8 Watch
- Mr. Manges will assume the duties and responsibilities of the 4-8 watch as outlined in the General and Specific watch procedures in the Officer-Faculty Guide, and will assume all duties and responsibilities of a Second Assistant Engineer not elsewhere described.

Enstice, L. R. ....12 - 4 Watch
- Mr. Enstice will assume the duties and responsibilities of the 12-4 watch as outlined in the General and Specific watch procedures in the Officer-Faculty Guide, and will assume all duties and responsibilities of a Third Assistant Engineer not elsewhere described.

Mercer, David C. ....8 - 12 Watch
- Mr. Mercer will assume the duties and responsibilities of the 8-12 watch as outlined in the General and Specific watch procedures in the Officer-Faculty Guide, and will assume all duties and responsibilities of a Fourth Assistant Engineer not elsewhere described.

The primary areas of responsibility fall into the following categories:

Chief Engineer:	Overall in charge
First Asst. Engineer:	Main engine, generators, refrigeration, steering engine
Electrical Officer:	All electrical equipment
Second Asst. Engineer:	Boilers, feedwater system, fuel oil
Third Asst. Engineer:	All lube oil systems
Fourth Asst. Engineer:	All water systems

Port watches in the Port of Galveston, will set as soon as feasible. Port watches will be 8 hours on watch and 16 hours off. The Cadets will be assigned similarly. Watch assignments are as follows:

Second Asst. Engineer:	0800 - 1600
Third Asst. Engineer:	1600 - 2400
Fourth Asst. Engineer:	0000 - 0800

The port watches in Galveston will be alert watches requiring the Engineer to be in the Engineering spaces to supervise and direct the Cadets. It is requested that the Engineer make every effort to instruct the Cadets in the proper manipulation of all boiler equipment and adjustments to the feedwater system. There will be approximately one week to drill the Cadets before departure.

At sea watches will be set in conjunction with the Deck Department well in advance of departure to insure a smooth transition, adaptation to the new schedule and adequate rest for all concerned.

In port watches at all other ports on the itinerary including port watches in Galveston upon the ship's return will be 24 hour watches. The watch will begin at 0800 and end at 0800 the following day. The Engineers will be available for work between 0800 and 1700 if the necessity exists. The remaining hours of the watch may be partially stood outside of the Engineering spaces. The Engineer is to make his whereabouts known in the Engine Room at all times, and should be in the Engine Room when Cadet watches are relieved. Sleeping privileges are extended to the Engineer to be used at his own discretion. With this system the Engineer will stand a 24 hour watch and have 48 hours free of any duties. The manner and sequence of watch rotation and the number of watches stood will be up to the discretion of the Engineers involved. It will be their responsibility to have one man on watch each day in port.

The Chief Engineer, the First Asst. Engineer and the Electrical Officer will be on day work throughout the Cruise.

The training program to be conducted during the Cruise will require that all Officers participate in the lectures. The stipulation is hereby made that when an Officer is assigned to a lecture he will make himself available to the Cadets involved at the time specified. A two hour lecture session has been provided for, however, it is up to the discretion of the officer how much of that time is actually necessary. If the material in the lecture is covered in less time and the Officer is satisfied that the Cadet has all the essential information, he may be released early. It will be the responsibility of the Cadets involved to contact the Officer and arrange the meeting place for the lecture. Lectures not held when specified may be held at any other time to be arranged. No lectures will be waived or cancelled.

All of the above is subject to change. Any recommendations or revisions that are deemed necessary please contact the First Asst. Engineer. Hopefully the assigned duties are in the best interests of the ship, the training program, the Engineering Department and the individual involved.

See you in Galveston,

Klaus V. Luehning

EXHIBIT IV

MEMORANDUM TO: Students, Department of Marine Engineering

FROM: Klaus V. Luehning
Engineering Training Officer

SUBJECT: Cruise Textbooks

1. The following lists of books are recommended to the Student Body for completing the required studies during the Summer Cruise 1965. They are on sale in the Ship's Service Store.

2. Senior Class students should have the following volumes:

   a. Osbourne, M.E. Manual I & II
   b. Hubert, Prev. Main. Elec. Equip.
   c. Baker, Intro, to Ship Cons.
   d. Seward, Marine Eng.

3. Junior Class should have the following volumes:

   a. Osbourne , Marine Eng. Manual
   b. Hubert, Prev. Main. Elec. Equip.
   c. Baker, Ship Cons.
   d. Seward, Marine Eng.
   e. Navpers, Electricity or Turner, Electricity

4. Sophomore Class should have the following volumes:

   a. King, Prac. Marine Eng.
   b. Osbourne, Marine Eng. Manual
   c. Hubert, Prev. Main. Elec. Equip.
   d. Navpers, Electricity or Turner, Electricity

EXHIBIT V

TO: Student Body,
Department of Marine Engineering

FROM: Klaus V. Luehning
Engineering Training Officer

SUBJECT: Section Assignments, Summer Cruise 1965

The student body of the Department of Marine Engineering is assigned to the sections and job categories as shown in the listing below. No changes will be allowed or authorized except in cases of emergency. Personal requests for changes will be considered if presented in writing to the Department. The sections will remain intact until the student body is released from the ship for leave at the end of the cruise.

<table>
<tr><th>SECTION</th><th>c/ENGINEER
c/FIRST ASST.
c/ELECTRICIAN
c/MACHINIST</th><th>c/JR. ENGINEER
c/OILER</th><th>c/F/WT
c/UTILITY</th></tr>
<tr><td>A</td><td>Brady</td><td>Donkervoet</td><td>Sikes
Baucom</td></tr>
<tr><td>B</td><td>Connor</td><td>Wagstaff</td><td>Abschneider</td></tr>
<tr><td rowspan="2">C</td><td rowspan="2">Miller</td><td colspan="2">-------------- Kuhns ------------</td></tr>
<tr><td>Fredrickson</td><td>Laughter</td></tr>
<tr><td>D</td><td>Resner</td><td>Marcontell</td><td>Ferguson
Keneson</td></tr>
<tr><td rowspan="2">E</td><td rowspan="2">Richards</td><td colspan="2">----------- McAuliffe -----------</td></tr>
<tr><td></td><td>Harris
Stong</td></tr>
<tr><td>F</td><td>Schmidt</td><td>Wedenburg</td><td>Michael</td></tr>
</table>